IX CBDEH
CONGRESSO BRASILEIRO PARA O DESENVOLVIMENTO DO EDIFÍCIO HOSPITALAR
CONEXÃO E DIVERSIDADE NOS ESPAÇOS DE SAÚDE

Centro de Convenções de Pernambuco - Auditório
Eixo 2 - Pandemias e epidemias: desafios e oportunidades.
Conferência 2 on Thursday 20th October 2022, 18:15 - 19:15

Título do trabalho:

HEALING ARCHITECTURE: the experience based approach for re-thinking the Next Generation Hospital

Stefano Capolongo

Head of the Department in Architecture, Built environment and Construction engineering [DABC] of Politecnico di Milano
Coordinator of the “European Chapter” of the International Academy for Design and Health [IADH]
President of the Italian Center for Hospital Building and Design [CNETO]
President of the “Urban Public Health” of the European Public Health Association [EUPHA]
mail. **stefano.capolongo@polimi.it**

Design&Health Lab. POLITECNICO DI MILANO
Department of Architecture, Built environment and Construction engineering

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Research Fellow

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Alessandro Morganti
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Silvia Mangili
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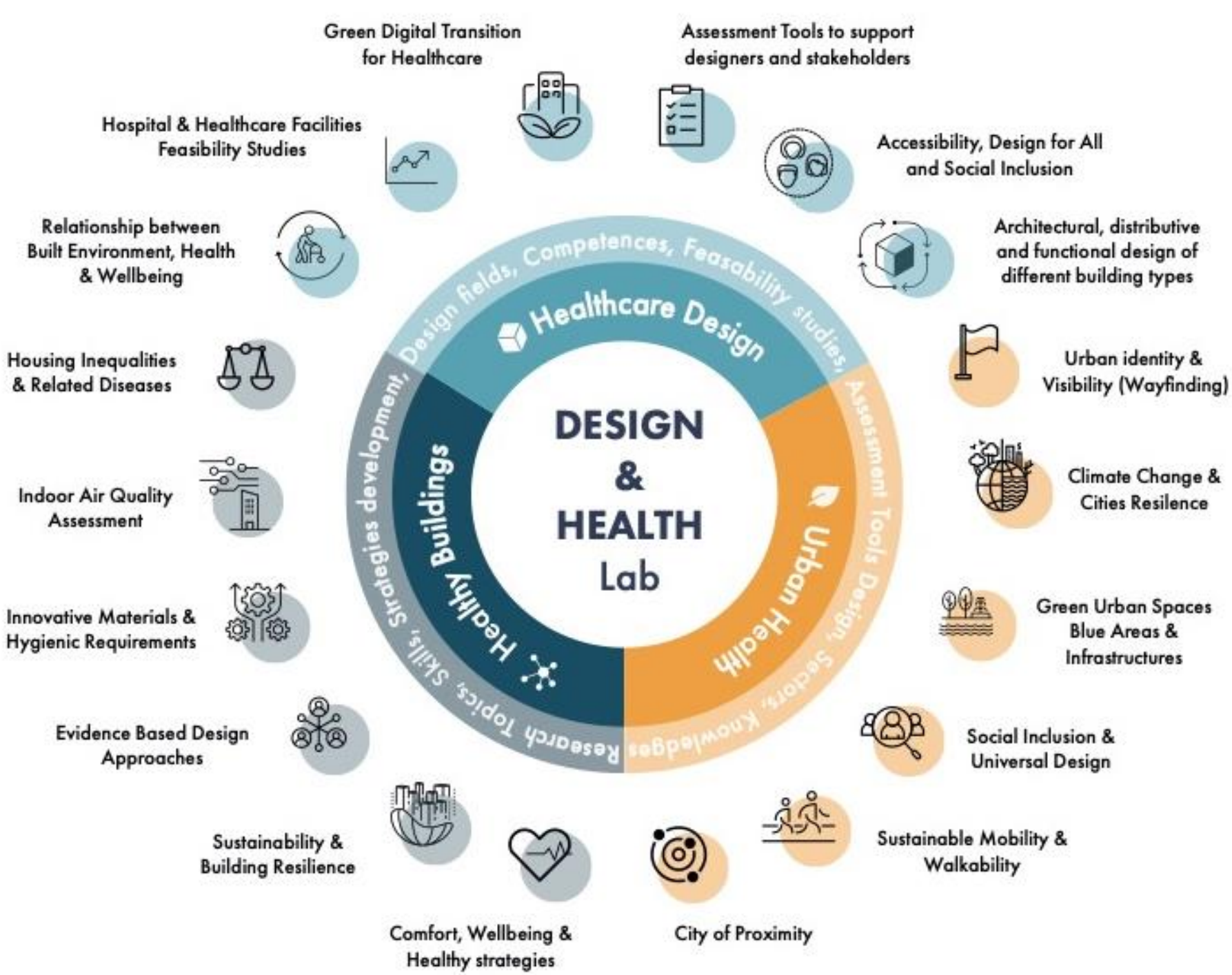
Tianzhi Sun
PhD Candidate

Erica Brusamolin
PhD Candidate

Yong Yu
PhD Candidate

Stefano Arruzzoli
PhD Candidate


Green Digital Transition for Healthcare
Assessment Tools to support designers and stakeholders
Hospital & Healthcare Facilities Feasibility Studies
Accessibility, Design for All and Social Inclusion
Relationship between Built Environment, Health & Wellbeing
Architectural, distributive and functional design of different building types
Housing Inequalities & Related Diseases
Urban identity & Visibility (Wayfinding)
Indoor Air Quality Assessment
Climate Change & Cities Resilence
Innovative Materials & Hygienic Requirements
Green Urban Spaces Blue Areas & Infrastructures
Evidence Based Design Approaches
Social Inclusion & Universal Design
Sustainability & Building Resilience
Sustainable Mobility & Walkability
Comfort, Wellbeing & Healthy strategies
City of Proximity
Design fields, Competences, Feasability studies,
Assessment Tools Design, Sectors, Knowledges
Research Topics, Skills, Strategies development,
Healthcare Design
Urban Health
Healthy Buildings
DESIGN & HEALTH Lab

PAST

THE EVOLUTION OF HEALTHCARE FACILITIES

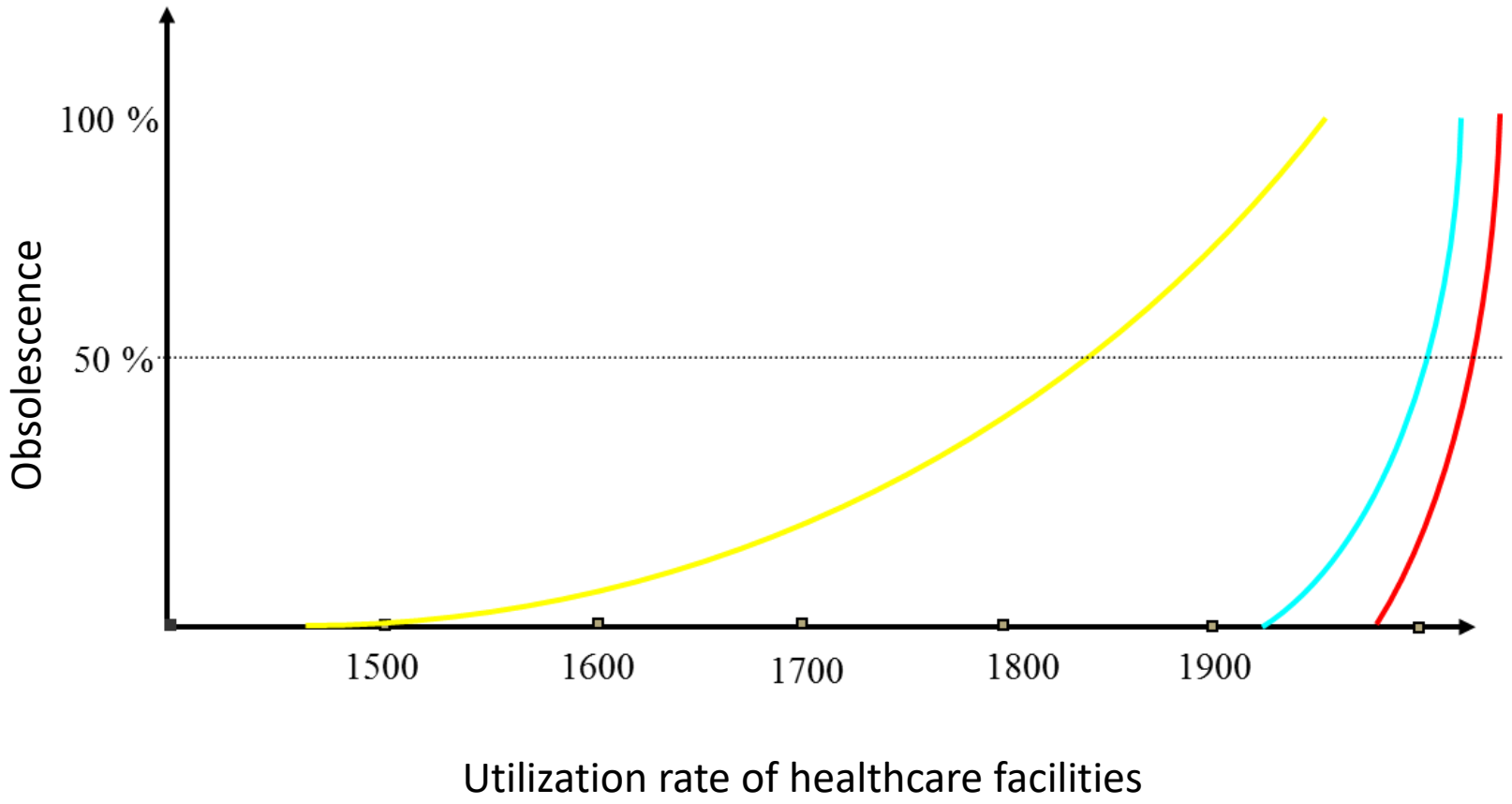
VENICE
LAZARET
1423

CA GRANDA
HOSPITAL
MILANO
1456

Hospital Architecture
Nickl-Weller, 2010

Stefano Capolongo
POLITECNICO DI MILANO

THE OBSOLESCENCE OF HEALTHCARE FACILITIES



European scenario

40-50 YEARS
HOSPITAL LIFE CYCLE

10-20 YEARS
DESIGN AND BUILDING TIME NEW HOSPITAL

70% OF ITALIAN HOSPITALS
HAVE MORE THAN 50 YEARS
(OPTIMAL LIFE SPAN) INAIL, 2012

50% OF ITALIAN HOSPITALS
CANNOT HOST CURRENT ORGANIZATIONAL MODELS
IRES, 2017

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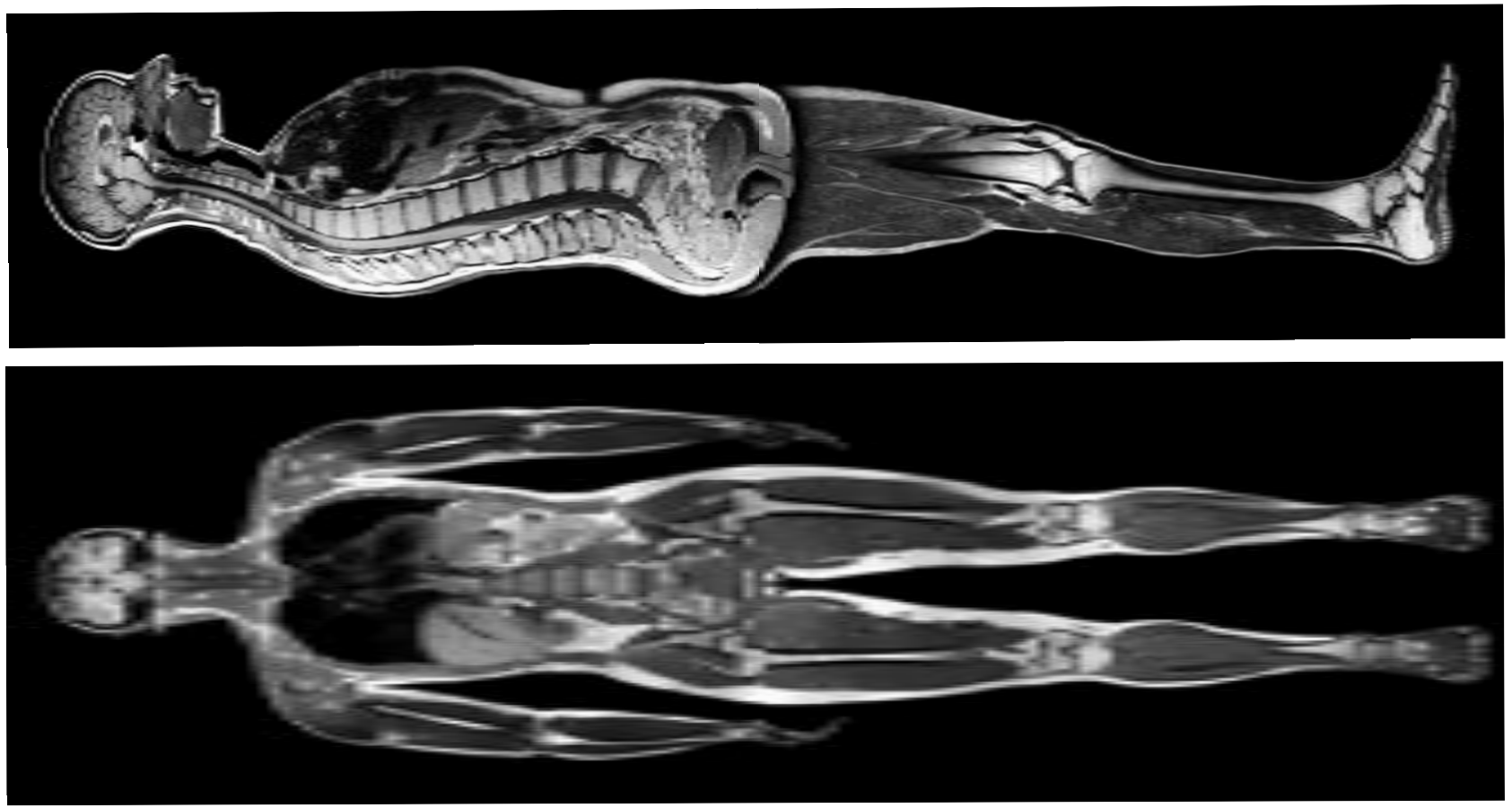
POLITECNICO DI MILANO

THE EVOLUTION OF HEALTHCARE FACILITIES



PREDICTIVE MEDICINE

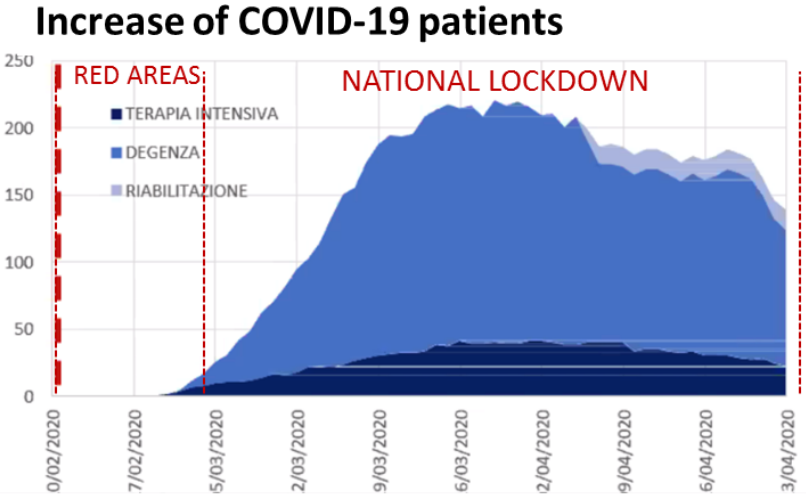
"In the next 10 years.
will change more than 80%
of knowledge and
of methods of diagnosis,
of therapy and especially
of prevention."

M. Mauri, Polisanità,
Politecnico di Milano

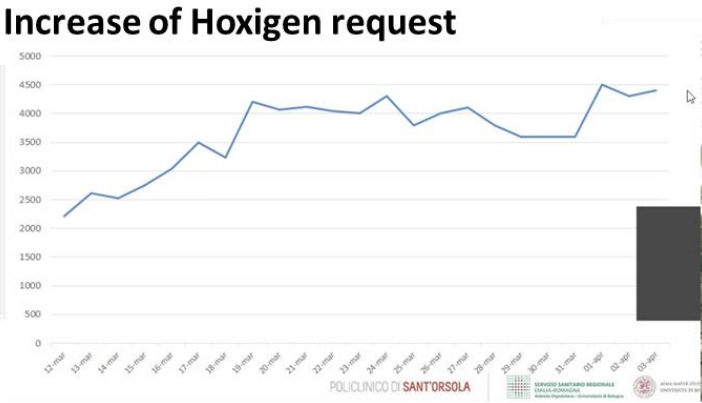

SIEMENS
AGNETOM
ESSENZA

PRESENT

THE COVID-19 CHALLENGE
NEW PRESPECTIVE IN THE HEALTHCARE SCENARIO



Ing. Simone Arduca – Humanitas Research Hospital



Ing. Daniela Pedrini

Ing. Matteo Persico – Ospedale Papa Giovanni XXIII Bergamo

Stefano Capolongo

POLITECNICO DI MILANO

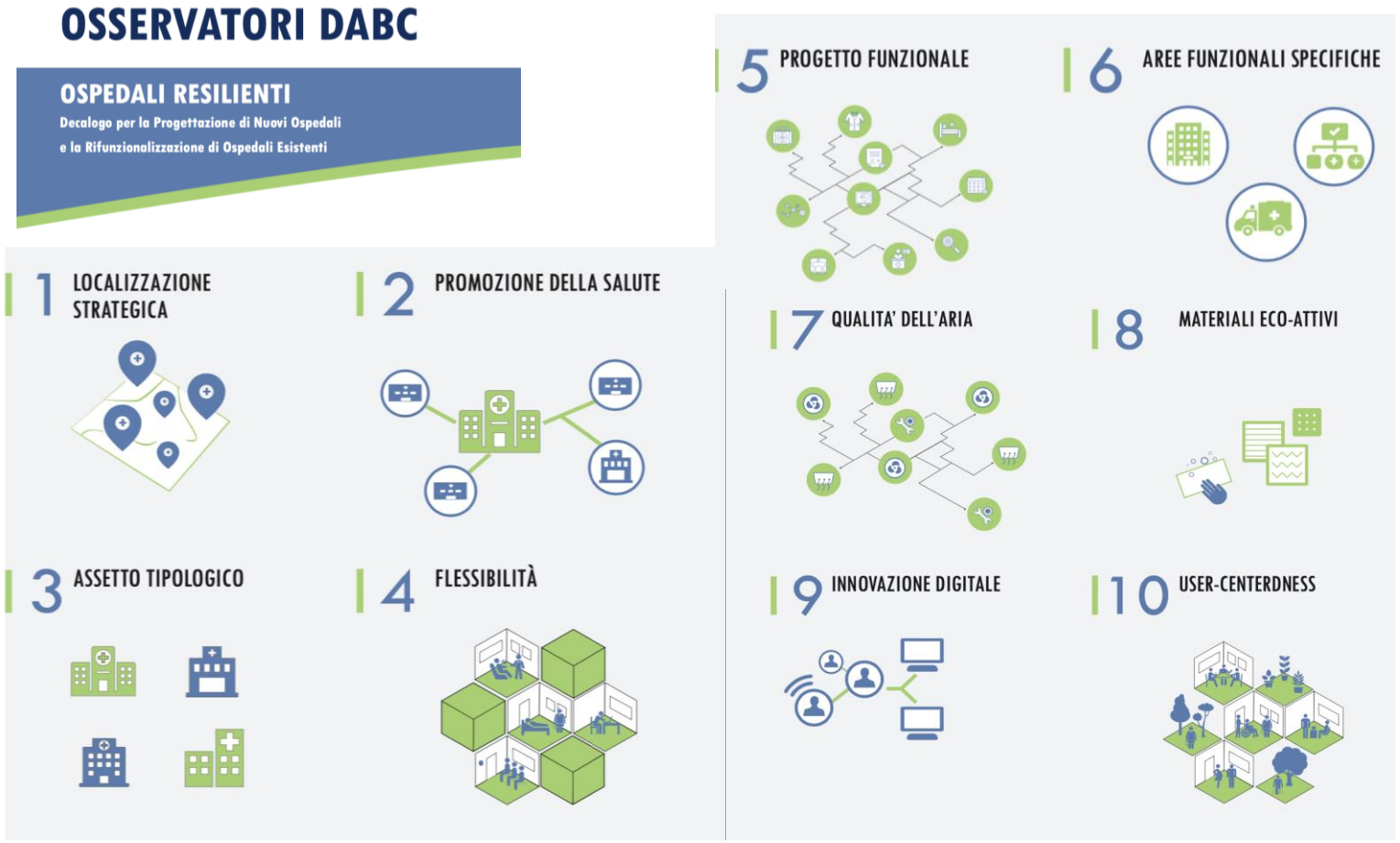
THE COVID-19 CHALLENGE
NEW DESIGN PERSPECTIVES

POLITECNICO
MILANO 1863

DIPARTIMENTO DI ARCHITETTURA,
INGEGNERIA DELLE COSTRUZIONI
E AMBIENTE COSTRUITO

DECALOGUE DABC-POLIMI **RESILIENT HOSPITALS:**

1. STRATEGIC LOCALIZATION
2. BUILDING TIPOLOGY
3. FLEXIBILITY / RESILIENCE
4. FUNCTIONAL PLANNING
5. SPECIFIC FUNCTIONAL AREAS
6. USER-CENTERDNES
7. INDOOR AIR QUALITY
8. ECO-ACTIVE MATERIALS
9. DIGITAL INNOVATION
10. HEALTH PROMOTION



Stefano Capolongo

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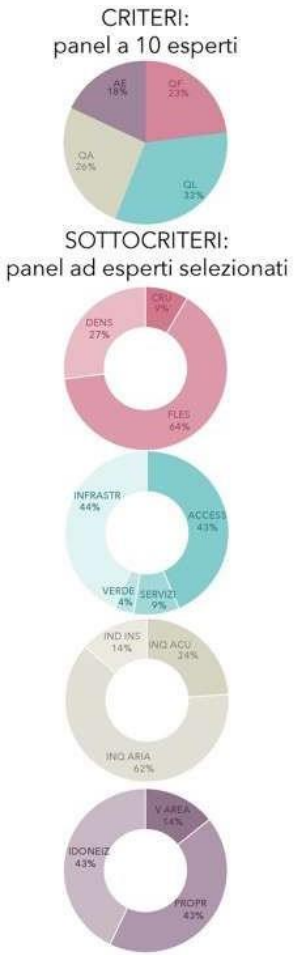
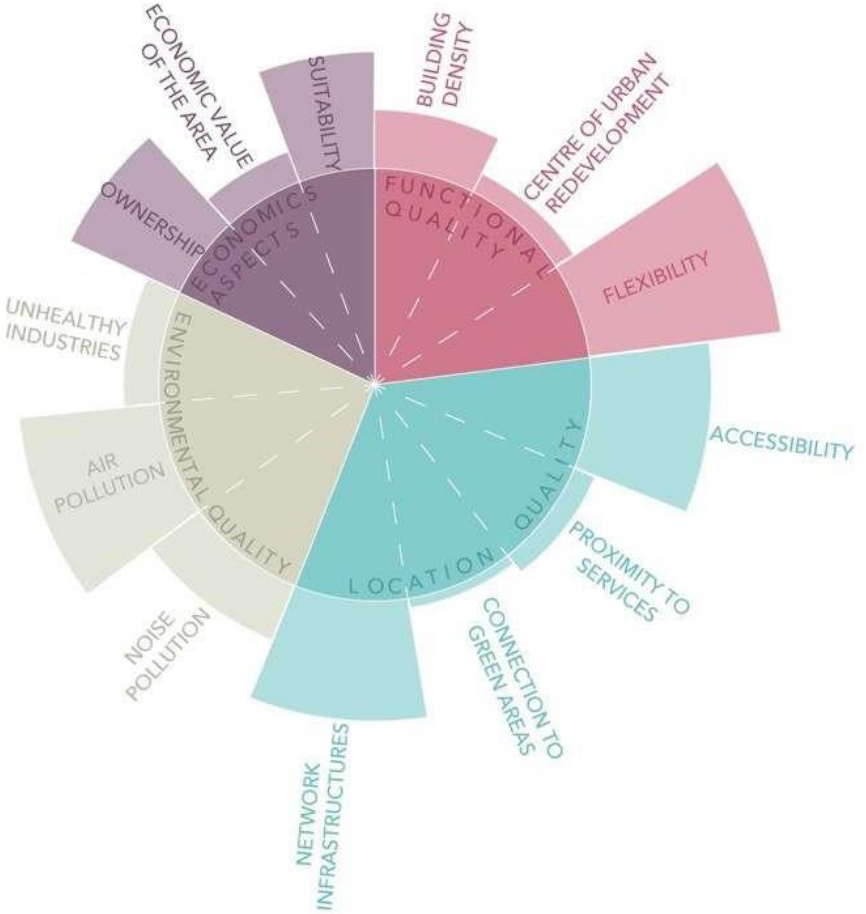
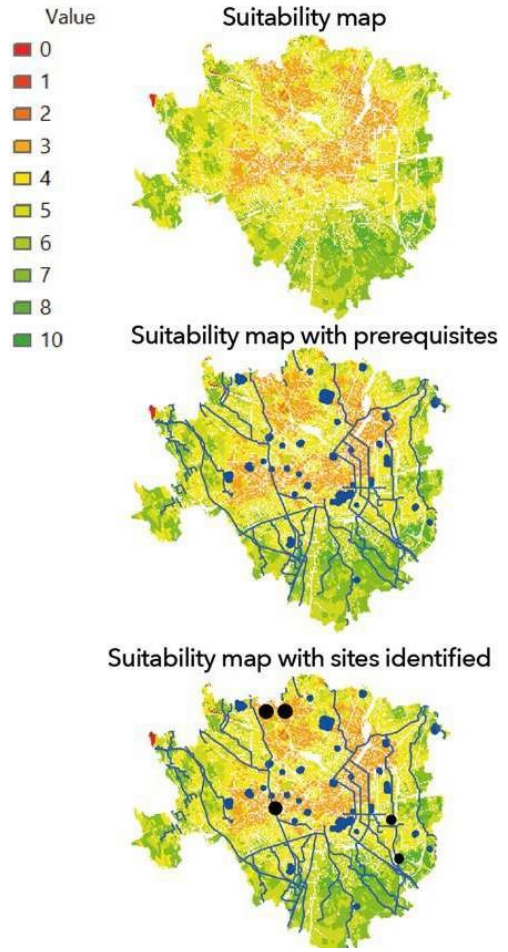
THE COVID-19 CHALLENGE
1. STRATEGIC LOCALIZATION

KEYWORDS:

- Accessibility
- Expansion areas
- Different access







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THE COVID-19 CHALLENGE
1. STRATEGIC LOCALIZATION

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THE COVID-19 CHALLENGE
1. STRATEGIC LOCALIZATION

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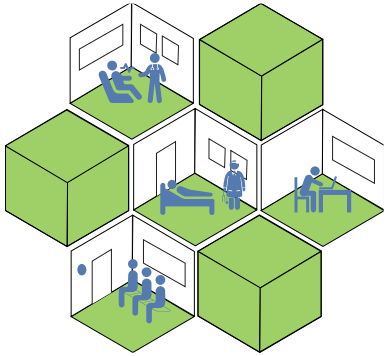
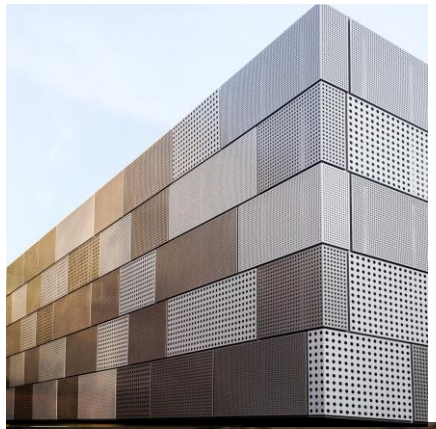
THE COVID-19 CHALLENGE
2. FLEXIBILITY / RESILIENCE



KEYWORDS:

- Resilience
- Adaptability
- Exchangeability
- Lung spaces
- Pre-fabrication

Martini Hospital, Groninegn



Neurologic Institute C. Besta, Milano Italy

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THE COVID-19 CHALLENGE
2. FLEXIBILITY / RESILIENCE

Martini Hospital, Groningen, SEED

Stefano Capolongo

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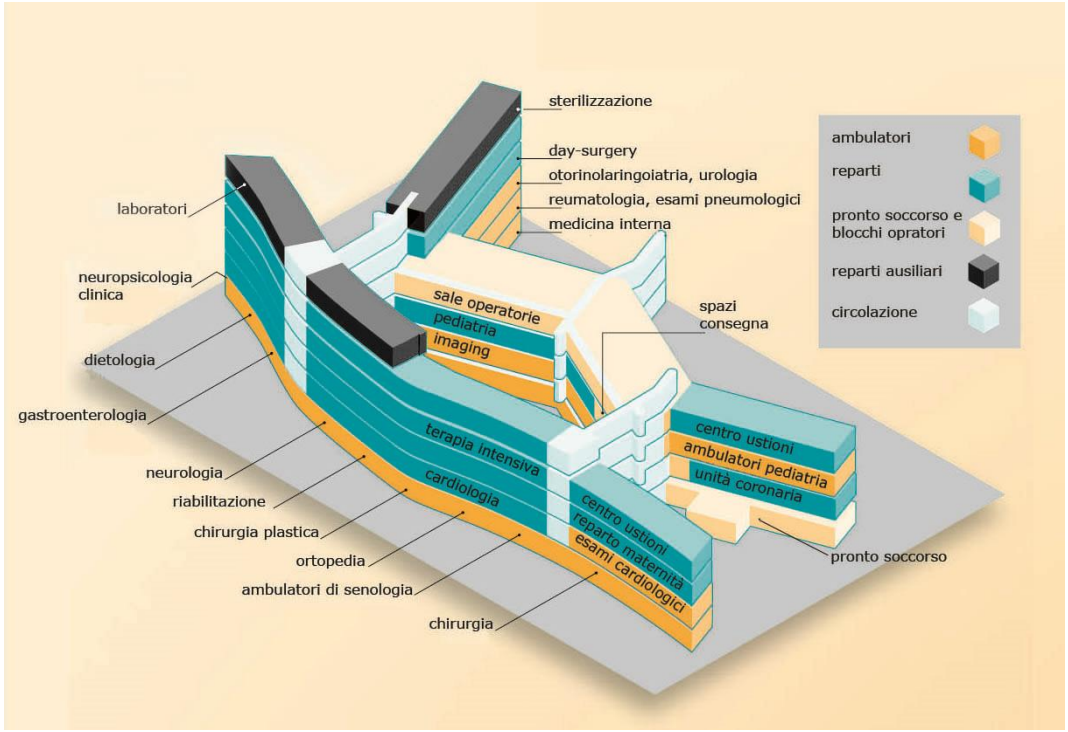
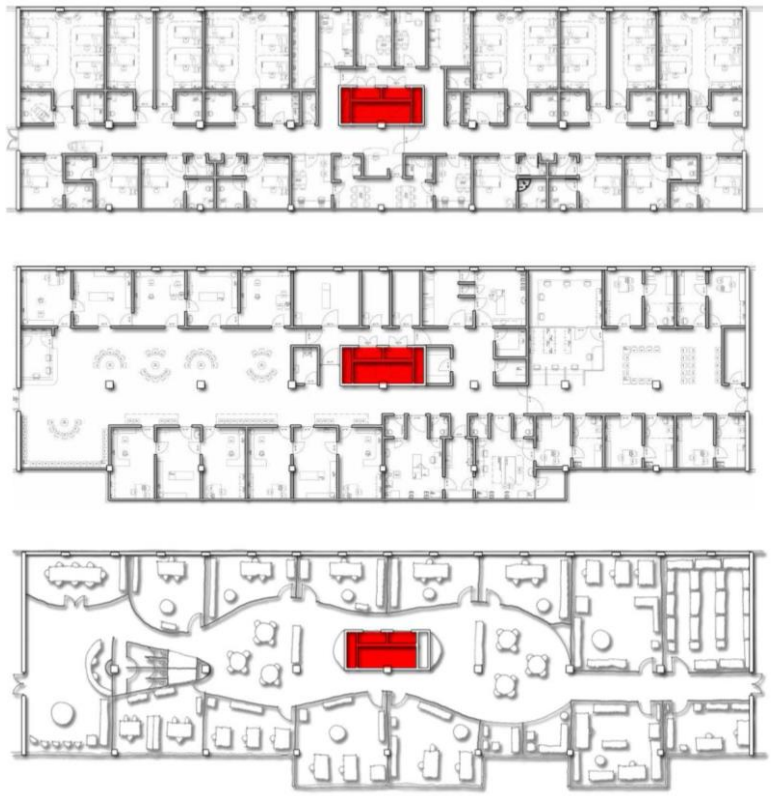
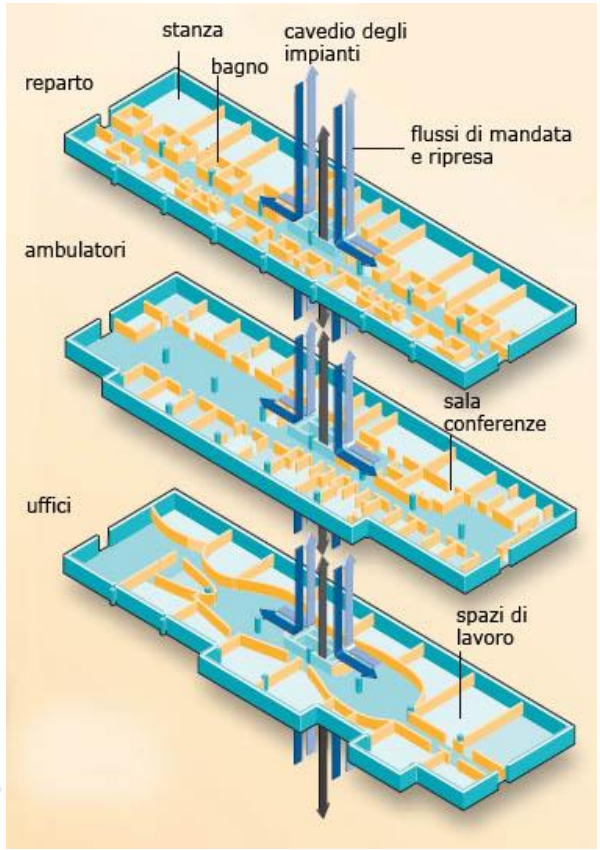
THE COVID-19 CHALLENGE
2. FLEXIBILITY / RESILIENCE

Martini Hospital, Groningen, SEED







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THE COVID-19 CHALLENGE
2. FLEXIBILITY / RESILIENCE

Sammy Ofer Hearth Building, Tel-Aviv, Israel

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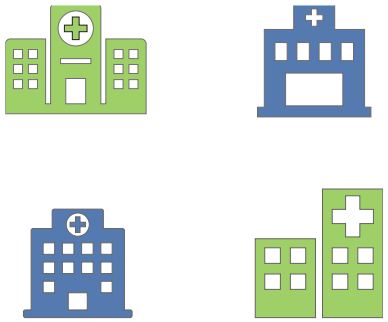
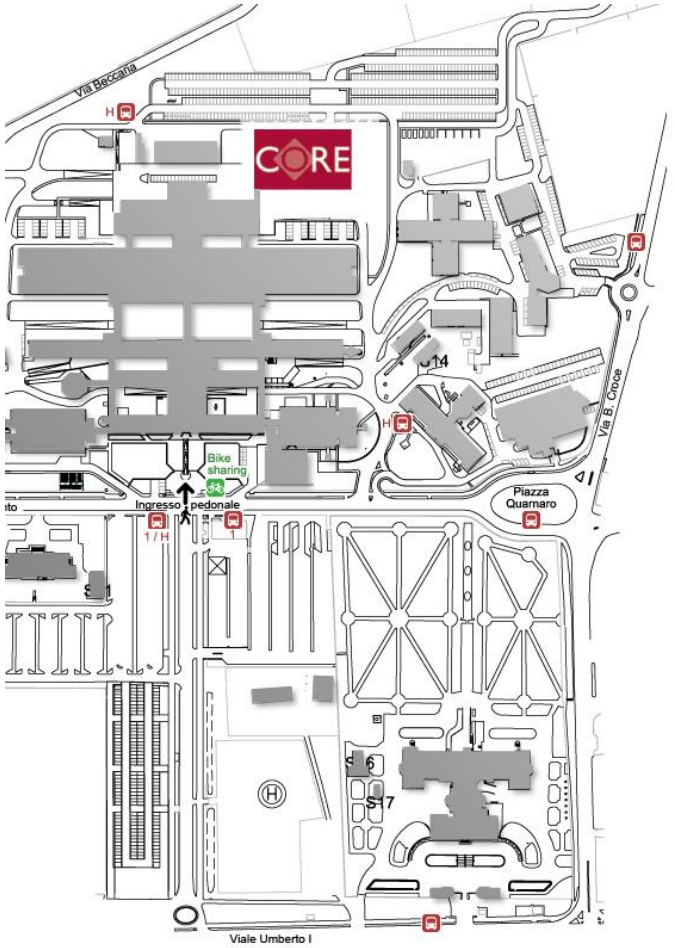
THE COVID-19 CHALLENGE
3. BUILDING TIPOLOGY



KEYWORDS:

- Satellite buildings
- Autonomus nucleous
- Compartiments

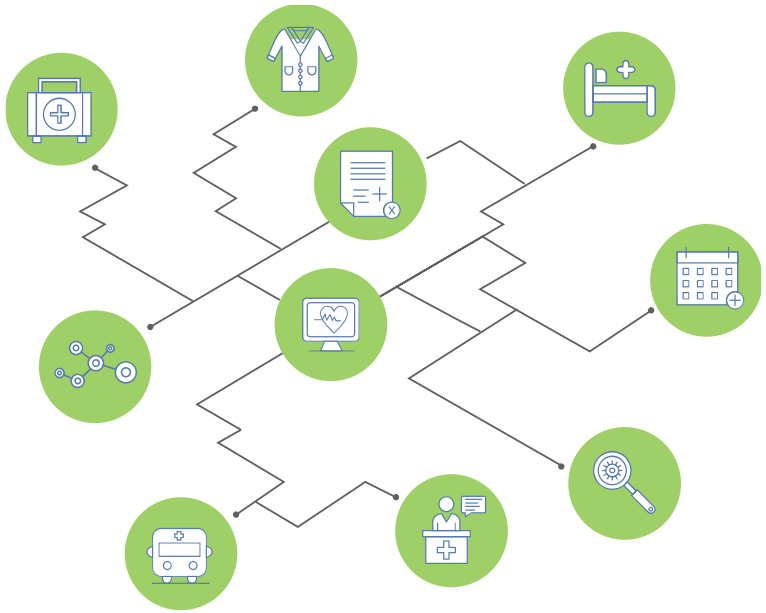


CORE / MIRE, Reggio Emilia

Stefano Capolongo

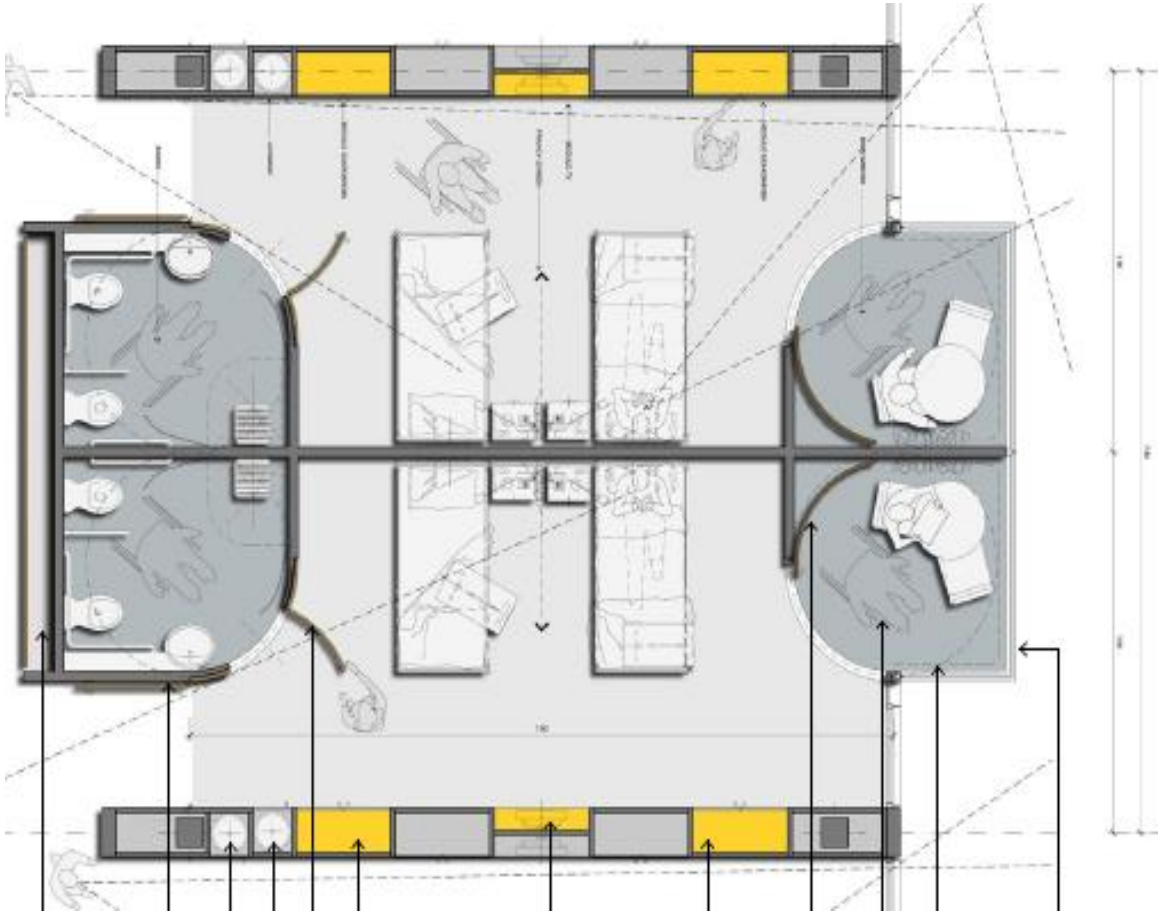
POLITECNICO DI MILANO

THE COVID-19 CHALLENGE
4. FUNCTIONAL PLANNING



KEYWORDS:

- Single patient rooms (+1)
- Fluxes and path differentiations
- Waiting room dimension



Città della Salute
RPBW, Milano

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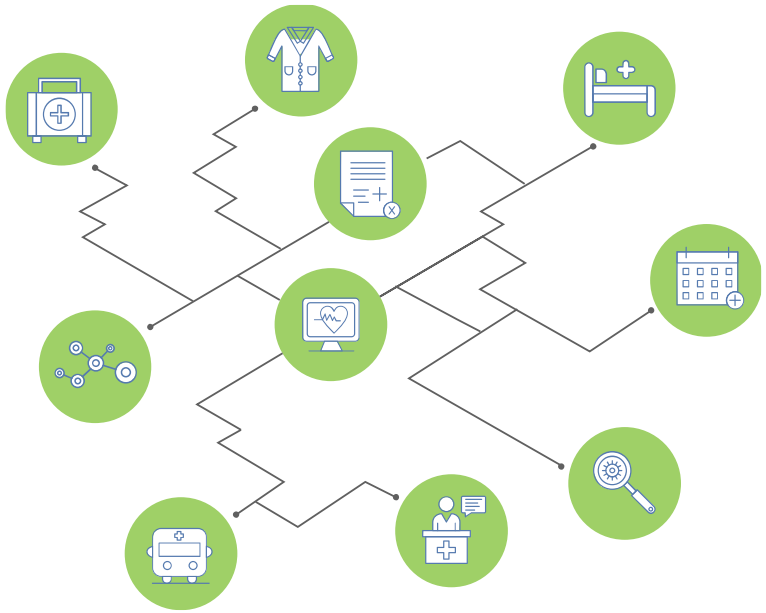
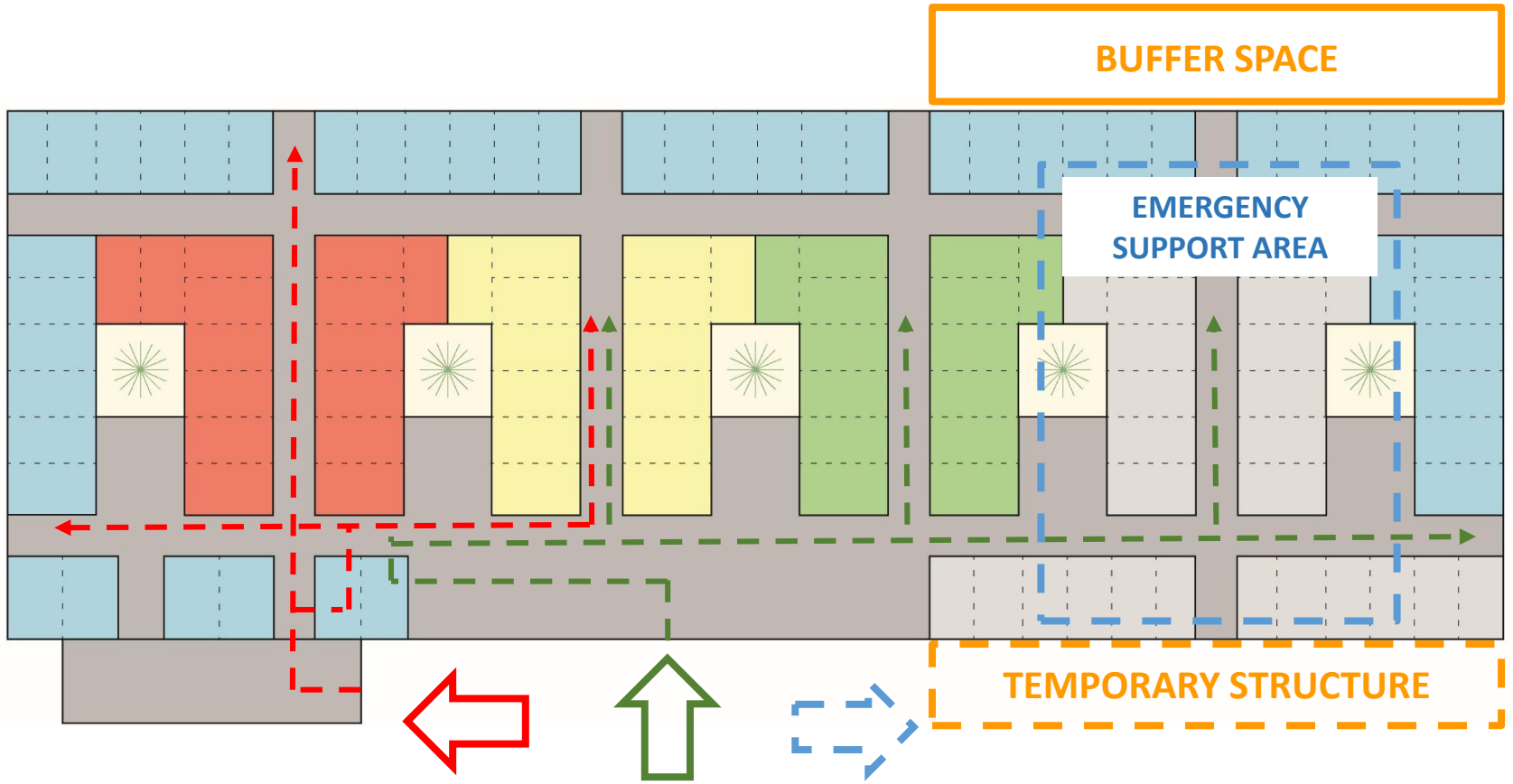
THE COVID-19 CHALLENGE
5. SPECIFIC FUNCTIONAL AREAS



KEYWORDS:

- Emergency Department
- Intensive Care Unit



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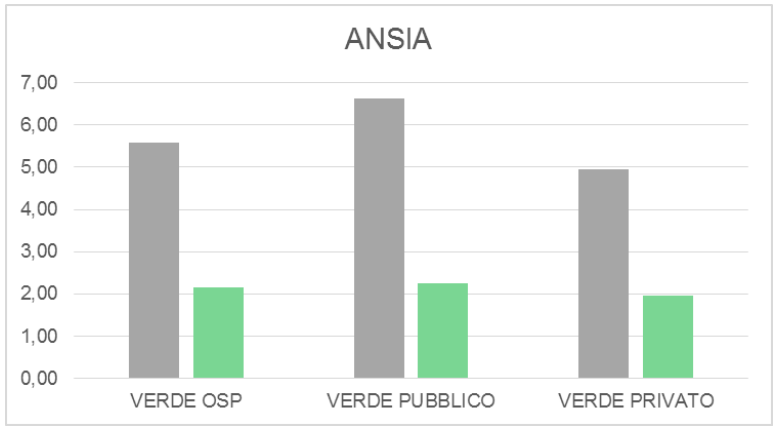
THE COVID-19 CHALLENGE
6. USER CENTERDENESS



A POLIMI survey showed during **lockdown,** how **30 min** of time in the **hospital green for healthcare staff greatly reduces the state of anxiety and stress.**

KEYWORDS:

- Amenities dedicated to staff
- Presence of green areas *& Healing Gardens*

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THE COVID-19 CHALLENGE
6. USER CENTERDENESS

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THE COVID-19 CHALLENGE
6. USER CENTERDENESS

Stefano Capolongo

POLITECNICO DI MILANO

THE COVID-19 CHALLENGE
6. USER CENTERDENESS

Stefano Capolongo

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THE COVID-19 CHALLENGE
6. USER CENTERDENESS

Stefano Capolongo

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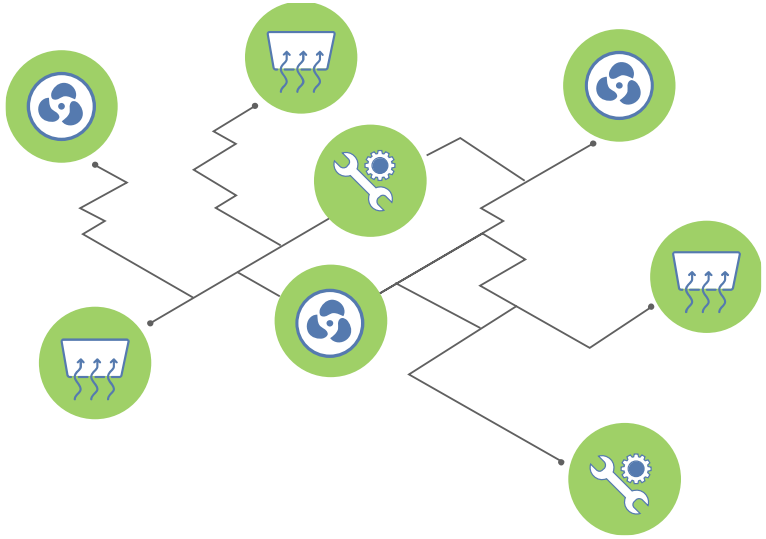
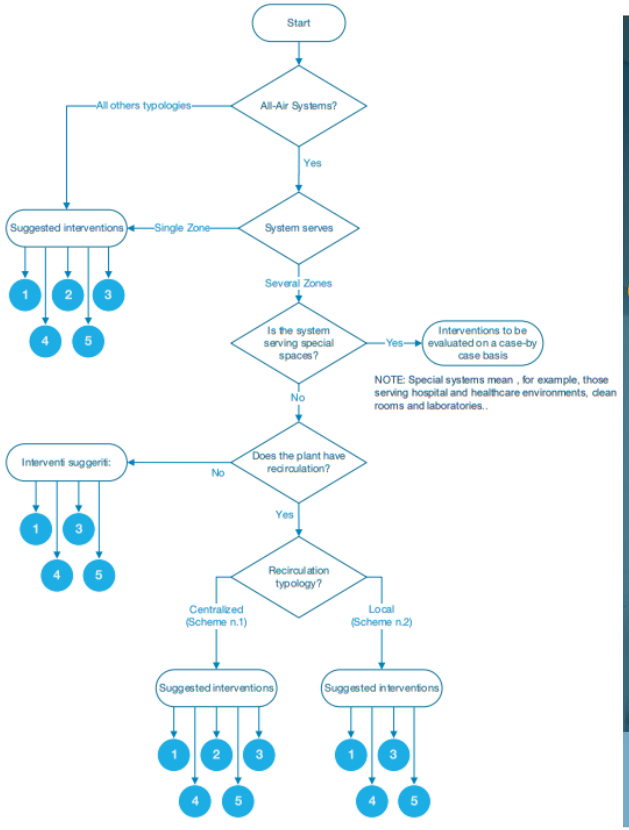
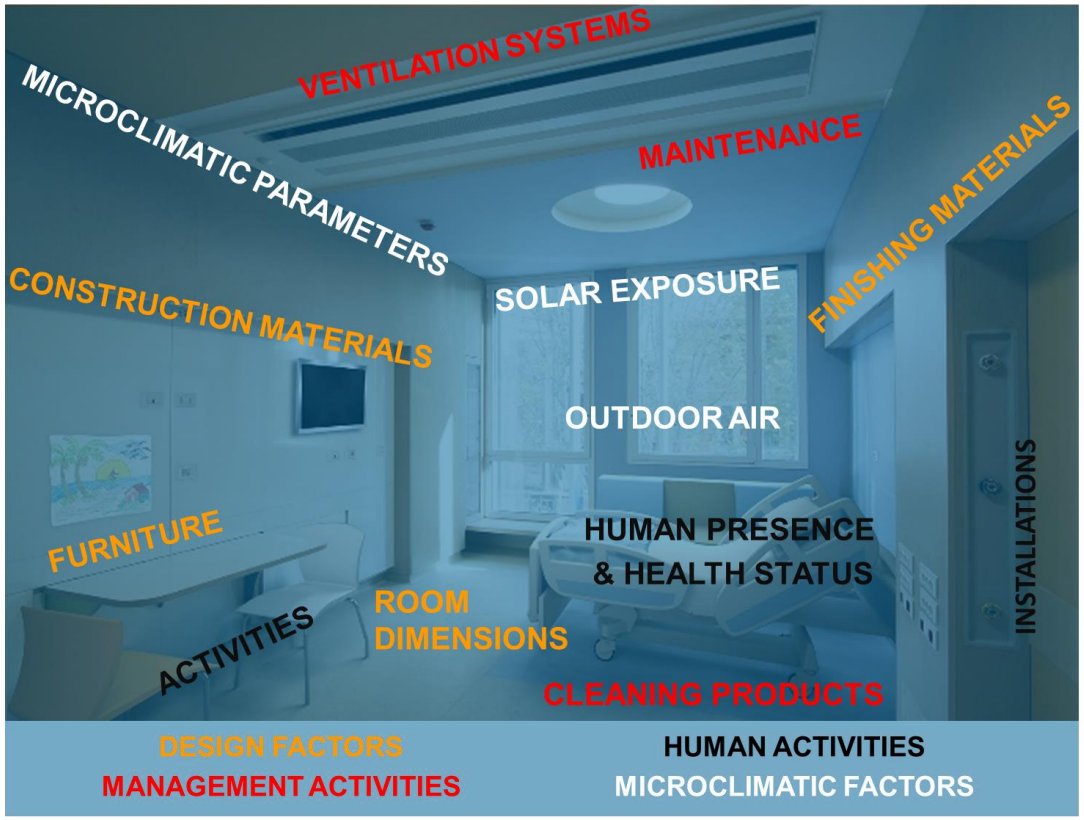
THE COVID-19 CHALLENGE
7. INDOOR AIR QUALITY







KEYWORDS:

- Ventilation systems
- Products' emissions

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THE COVID-19 CHALLENGE
8. INNOVATIVE AND ECO-ACTIVE MATERIALS

KEYWORDS:

- antiviral materials
- antibacterial materials
- photocatalytic materials
- suitable cleaning products

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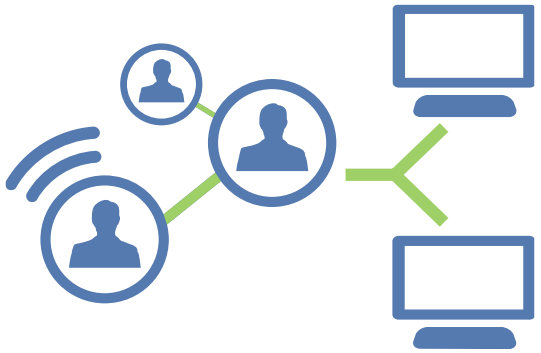
THE COVID-19 CHALLENGE
8. INNOVATIVE AND ECO-ACTIVE MATERIALS

Stefano Capolongo

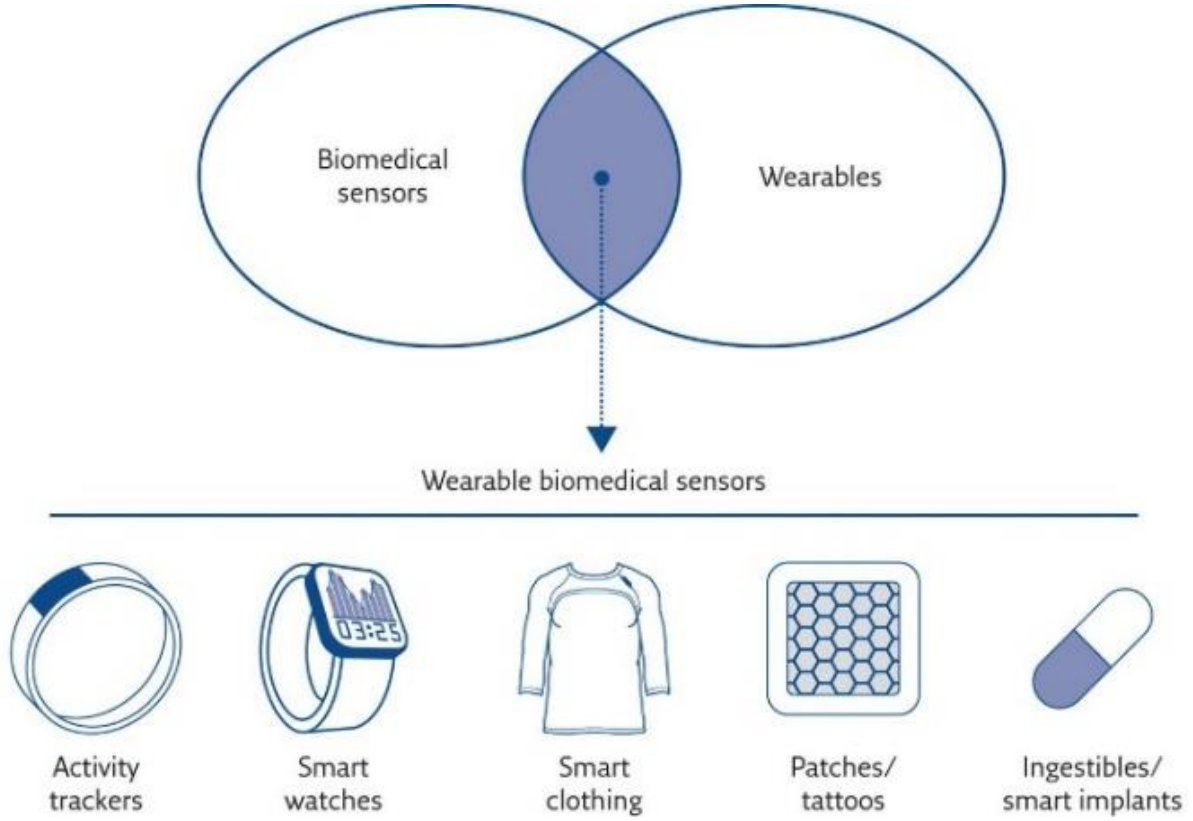
POLITECNICO DI MILANO

THE COVID-19 CHALLENGE
9. DIGITAL INNOVATION



KEYWORDS:

- installations
- ventilation systems
- diffused telemedicine
- Wearables systems
- sensory rooms



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THE COVID-19 CHALLENGE
9. DIGITAL INNOVATION

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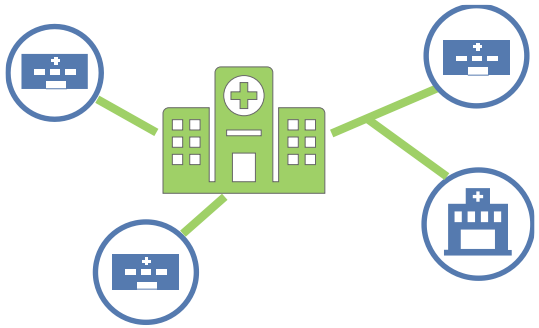
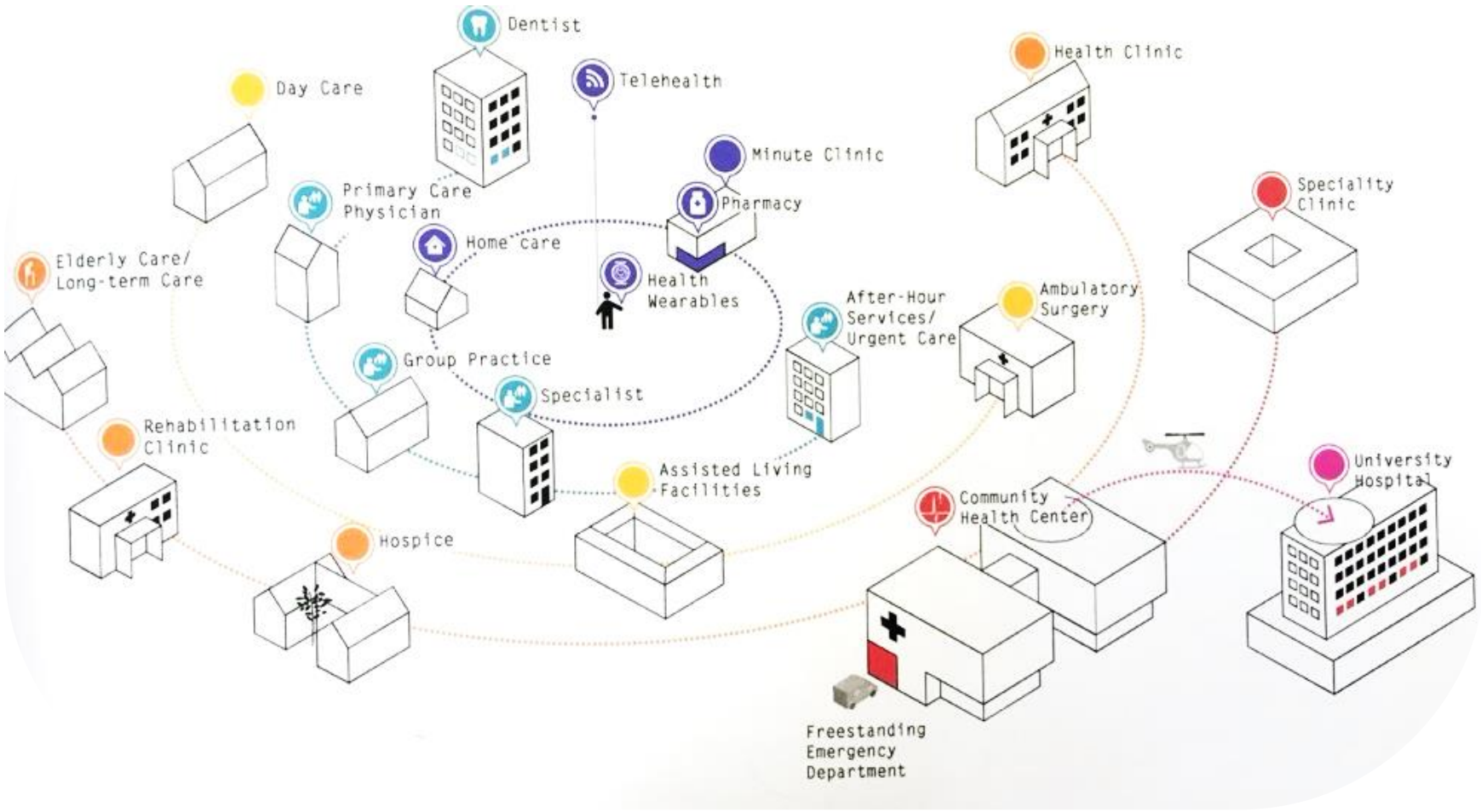
THE COVID-19 CHALLENGE
10. HEALTH PROMOTION AND PREVENTION



KEYWORDS:

- Community Houses
- Community Hospitals
- Rehabilitation Centers



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THE COVID-19 CHALLENGE
10. HEALTH PROMOTION AND PREVENTION

Barts' Maggie Center, London, UK

Center for Cancer and Health, Copenhagen, Denmark

Stefano Capolongo

POLITECNICO DI MILANO

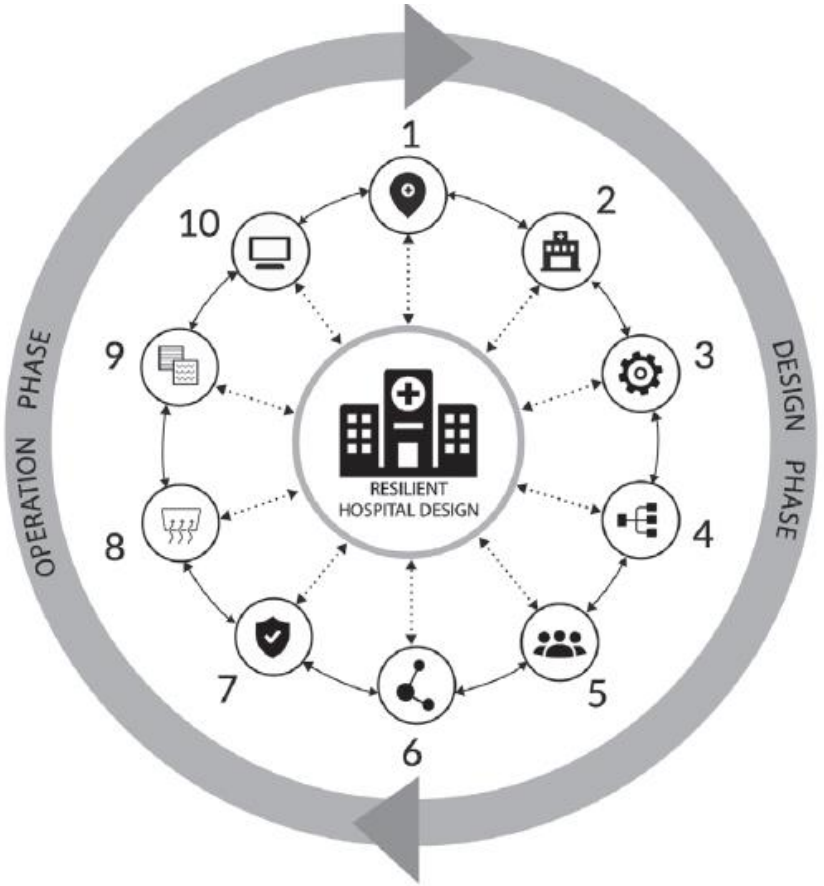
Acta Biomed 2020; Vol. 91, Supplement 9: IN PRESS DOI: 10.23750/abm.v91i9-S.10117

ORIGINAL ARTICLE

COVID-19 and Healthcare Facilities. A Decalogue of Design Strategies for Resilient Hospitals

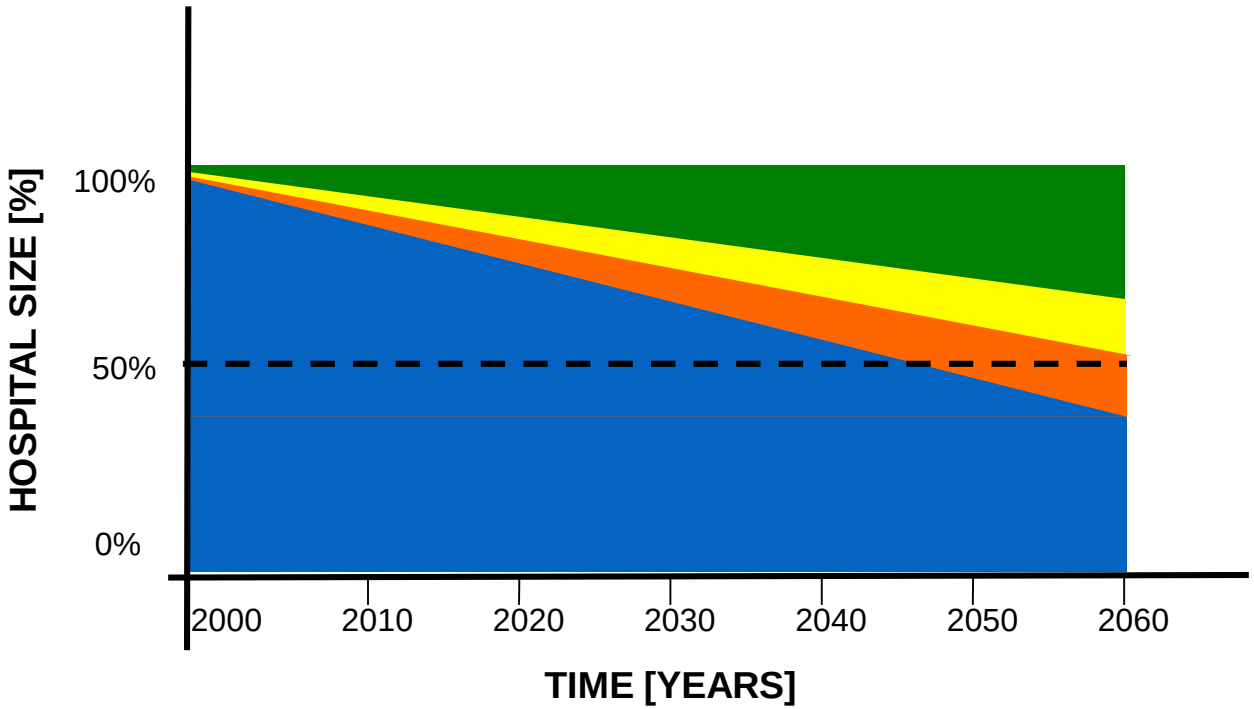
Stefano Capolongo[1], *Marco Gola*[1], *Andrea Brambilla*[1], *Alessandro Morganti*[1], *Erica Isa Mosca*[1], *Paul Barach*[2,3,4]

[1]Politecnico di Milano, Department of Architecture, Built environment and Construction engineering (DABC), Design and Health LAB, Italy; [2]Department of Pediatrics, Wayne State University School of Medicine, Detroit, MI, United States of America; [3]Jefferson College of Population Health, Philadelphia, PA, United States of America; [4]Sigmund Freud University, Wien, Austria



FUTURE

REORGANIZATION
OF HOSPITAL FACILITIES OVER TIME



- Diagnosis and treatment - traditional medicine
- Disease prevention
- Health promotion
- Predictive medicine

Stefano Capolongo

POLITECNICO DI MILANO

MISSION 6: HEALTH

BILLION OF EUROS

15,63

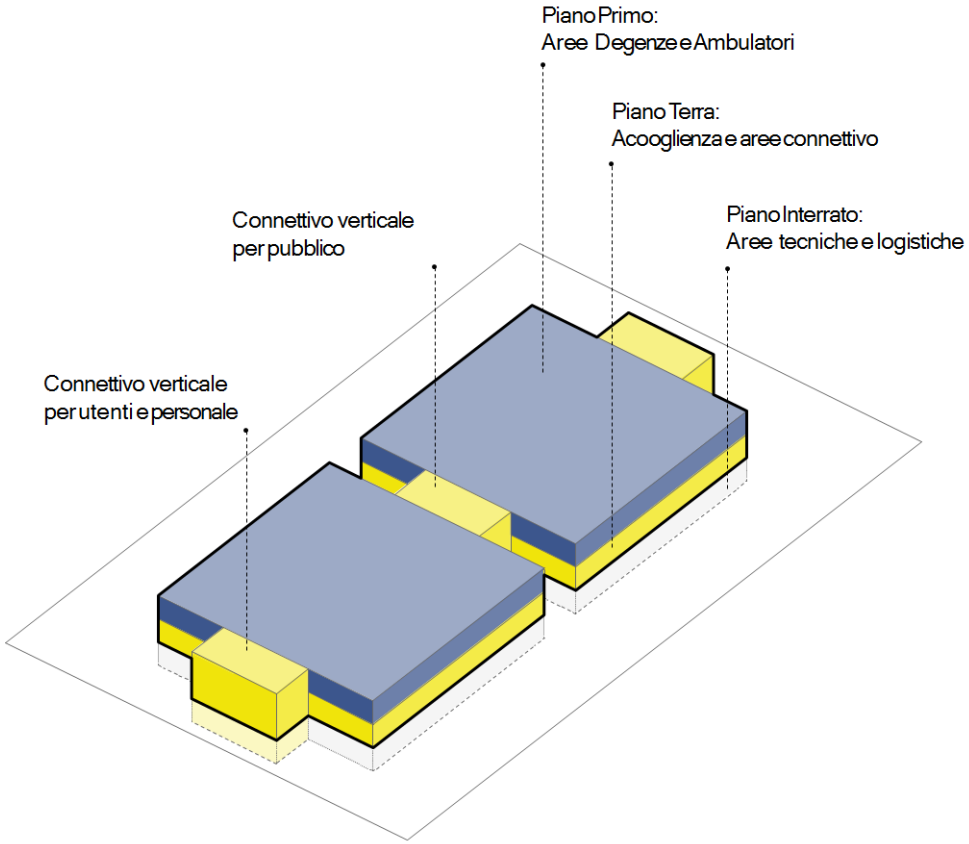
TOTAL

M6C1: PROXIMITY NETWORKS, FACILITIES AND TELEMEDICINE FOR TERRITORIAL HEALTH CARE	7,00
M6C2: INNOVATION, RESERACH AND DIGITALIZATION OF NATIONAL HEALTH SERVICE	8,63

Stefano Capolongo

POLITECNICO DI MILANO

MISSION 6: HEALTH / M6C1: PROXIMITY NETWORKS, FACILITIES AND TELEMEDICINE FOR TERRITORIAL HEALTH CARE



SCHEMA 3D

Proximity networks, intermediate structures and telemedicine for territorial health care

The interventions of this component aim to strengthen the services provided on the territory thanks to the strengthening and creation of territorial structures and garrisons (such as **Community Homes and Community Hospitals**), the strengthening of home care, the development of telemedicine and a more effective integration with all socio-health services

Investment 1: Community homes and personal care

Investment 2: Home as the first place of care, home care and telemedicine

Investment 3: Development of intermediate care

Stefano Capolongo

POLITECNICO DI MILANO

MISSION 6: HEALTH / M6C2: INNOVATION, RESERACH AND DIGITALIZATION OF THE NATIONAL SERVICE

Ospedale Pediatrico Meyer (Italia), 2006

Innovation, research and digitalization of the National Health Service
the measures included in this component will permit the renewal and modernization of existing technological and digital structures, the completion and diffusion of the Electronic Health File (Fascicolo Sanitario Elettronico - FSE), an improved capacity for the provision and monitoring of the Essential Levels of Care (Livelli Essenziali di Assistenza - LEA) through more effective information systems. Significant resources are also earmarked for scientific research and to promote technology transfer, as well as to strengthen the skills and human capital of the NHS, including through the strengthening of staff training.

Investment 1.1: Modernization of the hospital technological and digital park
Investment 1.2: Towards a safe and sustainable hospital
Investment 2.1: Enhancement and strengthening of biomedical research in the NHS
Investment 2.2: Development of technical, professional, digital and managerial skills of health system staff

Stefano Capolongo
POLITECNICO DI MILANO

NEW CHALLENGES
FLEXIBILITY ASSESSMENT FOR HOSPITAL FACILITIES

POLITECNICO
MILANO 1863

DIPARTIMENTO DI ARCHITETTURA,
INGEGNERIA DELLE COSTRUZIONI
E AMBIENTE COSTRUITO

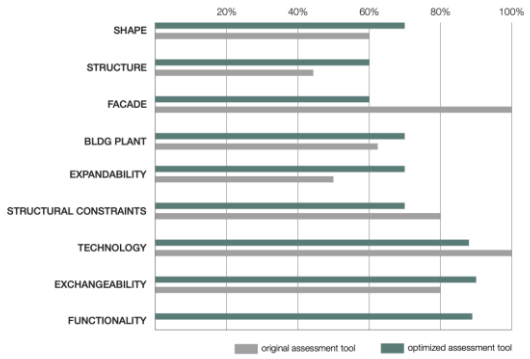
International Journal of
Environmental Research and Public Health

MDPI

Article

Flexibility during the COVID-19 Pandemic Response: Healthcare Facility Assessment Tools for Resilient Evaluation

Andrea Brambilla [1,2,*], Tian-zhi Sun [1], Waleed Elshazly [3], Ahmed Ghazy [3], Paul Barach [1,4,5], Göran Lindahl [1,2] and Stefano Capolongo [1]



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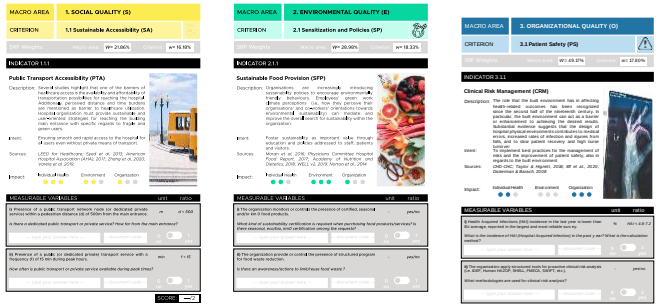
POLITECNICO DI MILANO

NEW CHALLENGES
ASSESSMENT OF HOSPITAL SUSTAINABILITY

JUMPSTARTER
Funded by the European Union

POLITECNICO MILANO 1863
DIPARTIMENTO DI ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO



SUSTHEALTH 2.0

SOCIAL QUALITIES
- Sustainable Accessibility
- Users Security
- Space Control and Awareness
- Inclusion and Attractiveness
- Health Promotion
- Visual Environment

+

ORGANIZATIONAL QUALITIES
- Patient Safety
- Monitoring and Certifications
- Future Proofing Facility
- Logistics and Efficiency
- Technological Innovation
- Facility Management

+

ENVIRONMENTAL QUALITIES
- Policies and Education
- Waste Management
- Energy Management
- Perceived IEQ
- Wayfinding and Ergonomy

3 areas
12 criteria
53 indicators
209 variables

Brambilla, Rebecchi & Capolongo Evidence-based Hospital Design, 2019
Brambilla, Buffoli & Capolongo Measuring Hospital Qualities, 2019
Brambilla, Lindahl, Dell'Ovo & Capolongo Validation of a Multiple Criteria Tool for Healthcare Facilities Quality Evaluation, 2020

Online at **sust.health**

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NEW CHALLENGES
OPEN ROOM

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DIPARTIMENTO DI ARCHITETTURA,
INGEGNERIA DELLE COSTRUZIONI
E AMBIENTE COSTRUITO

Capolongo et Al, Alta Scuola Politecnica XI-XIII cycle concept development
Brambilla, Finalist at Medaglia D'Oro all'Architettura – section Young, 2018
Gola et Al, Open Building Conference, 2019
AIA Academy of Architecture for Health, 2017

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NEW CHALLENGES
DESIGN FOR ALL

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Evaluating «Design for All» in Healthcare Environments. A new tool to assess Physical, Sensory-cognitive and Social quality – Design for All A.U.D.I.T. (Assessment Usability Design & Inclusion Tool).
Erica Isa Mosca (2021) Politecnico di Milano.
PhD program in Architecture, Built environment and Construction engineering.

15%

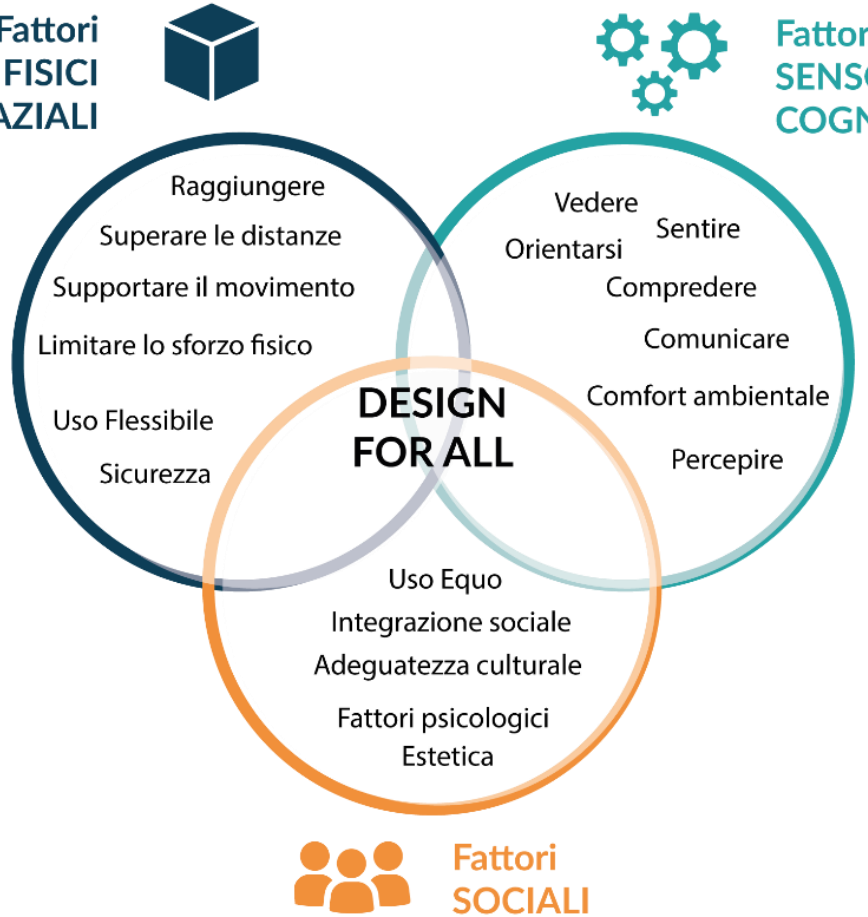
EU population has PERMANENT limitations

30%

EU population has TEMPORARY limitations

45%

EU population has SITUATIONAL limitations



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NEW CHALLENGES
MOBILE HEALTHCARE: FASTCARE

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DIPARTIMENTO DI ARCHITETTURA,
INGEGNERIA DELLE COSTRUZIONI
E AMBIENTE COSTRUITO

THE CONTEXT

NON COMUNICABLE DISEASE **63%** OF THE 57 MILION DEATH OCCURED IN 2015

PROBABILITY OF DYING PREMATURELY FROM NON-COMMUNICABLE DISEASES

Source: World Health Organization 2015

PRINCIPAL CAUSES OF NON-COMMUNICABLE DISEAES

Source: Welf and Harvard school of public health

THE PROJECT

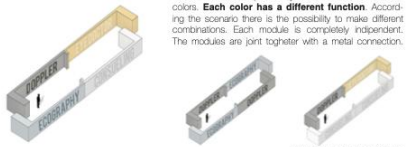
CONCEPT

In the last 10 years the number of people that use the train as means of transport is increasing, and in the future will be more. **We spend more time than we think in the trains and the target of the project is to make that time usefull**. This is the starting point of the concept of **FASTCARE**. The concept is based on 3 steps: Re-use a standard wagon / make a cut on the lateral facades / Insert the Fastcare modules. **The standard dimension of a wagon is a key point to create a project that could work everywhere.**

STEP 1 - *Re-use a train wagon* STEP 2 - *Cut the lateral facade* STEP 3 - *Insert Fastcare modules*

DIFFERENT SCENARIO - DIFFERENT COMBINATIONS

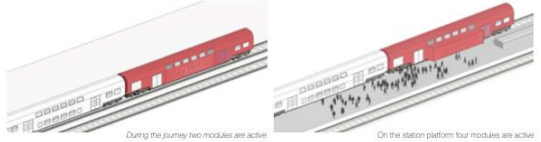
FAST-CARE is composed by four modules of different colors. **Each color has a different function**. According the scenario there is the possibility to make different combinations. Each module is completely indipendent. The modules are joint togheter with a metal connection.



Example of module combinations

FUNCTION DURING THE JOURNEY AND STATIONARY

The wagon works in both situation: during the journey all the modules are closed for logical reason of space. In this situation only two modules works . When the train stops at the station is possible to open one of the two side of the wagon to have all four modules actives



During the journey two modules are active *On the station platform four modules are active*

PLAN - WAGON WHEN TWO MODULES ARE OPEN

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NEW CHALLENGES
MASSIVE VACCINATION CENTERS

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Validation Checklist for Massive Vaccination Centers |

Checklist di Validazione dei Centri Vaccinali Massivi

Place | *Luogo*	Date | *Data*

Part 1: General structural requirements | Parte 1: Requisiti strutturali generali

CRITERIA | *CRITERI*	INDICATORS | *INDICATORI*	
Typology | *Tipologia*	The facility has large internal areas without fixed vertical partitions or with easy removable ones | *La struttura possiede ampie aree interne senza partizioni verticali fisse o con partizioni facilmente rimovibili*	
	The facility is completely covered | *La struttura è interamente coperta*	
	The area is adeguate to the inclusion of boxes with regular dimension in variable number | *L'area si presta all'inserimento di box di dimensione regolare in numero variabile*	
Technological Systems | *Impianti*	There are technological elements for fire prevention and safety | *Sono presenti elementi tecnologici per la prevenzione di incendi*	
	There are standard-compliant electric/hydraulic and ventilation systems | *Sono presenti impianti elettrici/idraulici e di ventilazione conformi alle normative vigenti*	
	There is auxiliary power system | *E' presente un impianto di genereazione ausiliaria*	
	Visibility through natural and/or artificial lighting is guaranteed during all times of activity | *La visibilità tramite illuminazione naturale o artificiale è garantita in tutte le fasce orarie in cui il centro vaccinale è attivo*	
	Existing ventilation systems allows the management of adeguate air exchanges rate inside the envirorments | *I sistemi di ventilazione esistenti permettono di garantire all'interno degli ambienti la corretta gestione dei ricambi d'aria*	
	There is a data network distribution facility | *E' presente un impianto di distribuzione delle rete dati*	
General Layout | *General Layout*	The general layout is composed by different areas: reception, acceptance, anamnesis, inoculation, observation | Il layout generale è composto da varie aree: accoglienza, accettazione, anamnesi, inoculazione, osservazione	

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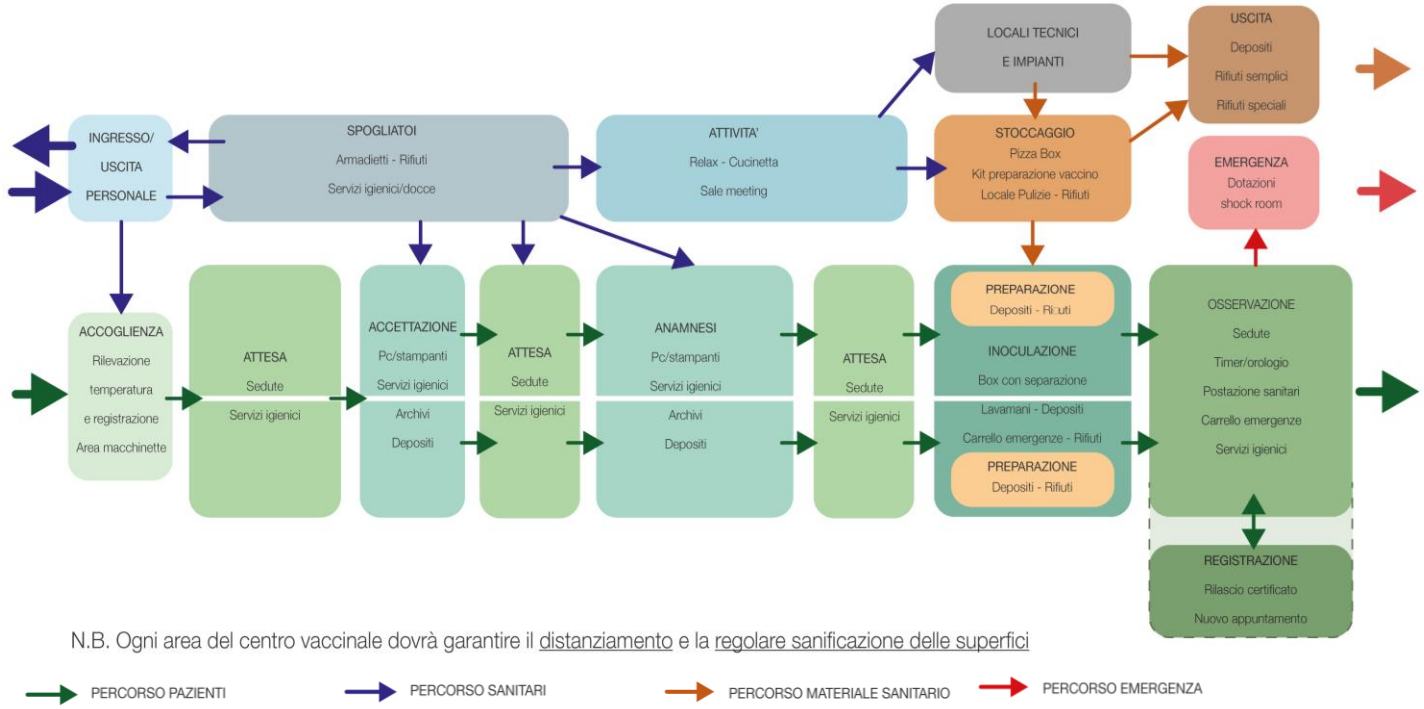
Acta Biomed. 2021; Vol. 92, Supplement 6: e2021446 DOI: 10.23750/abm.v92iS6.12229

ORIGINAL INVESTIGATIONS/COMMENTARIES

Covid-19 Massive Vaccination Center Layouts. A modular and Scalable Model for Lombardy Region, Italy

Andrea Brambilla[1], Silvia Mangili[1], Marco Macchi[2], Paolo Trucco[2], Alessandro Perego[2], Stefano Capolongo[1]

[1]Politecnico di Milano, Department of Architecture, Built environment and Construction engineering (DABC), Design & Health Lab, Milano, Italy; [2]Politecnico di Milano, Department of Management, Economics and Industrial Engineering (DIG), Milano, Italy



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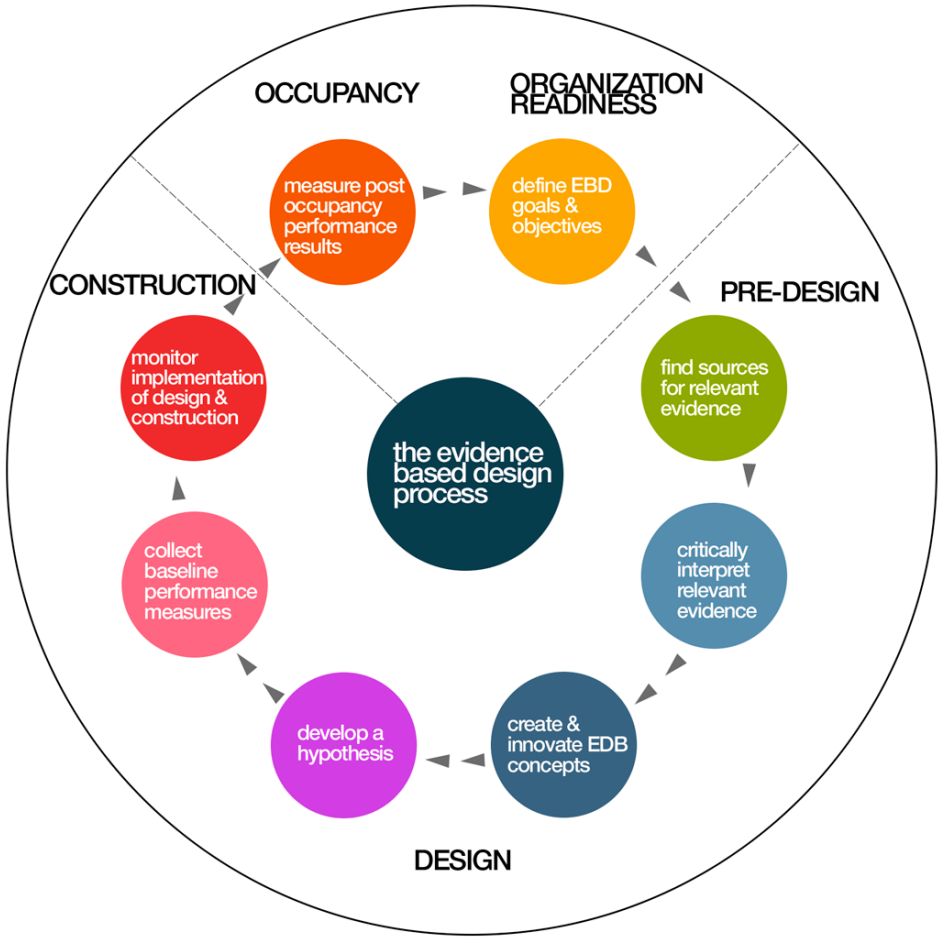
NEW CHALLENGES
EXPERIENCED / EVIDENCE - BASED DESIGN




Ulm Hospital, Germany

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NEW CHALLENGES
CO-DESIGN

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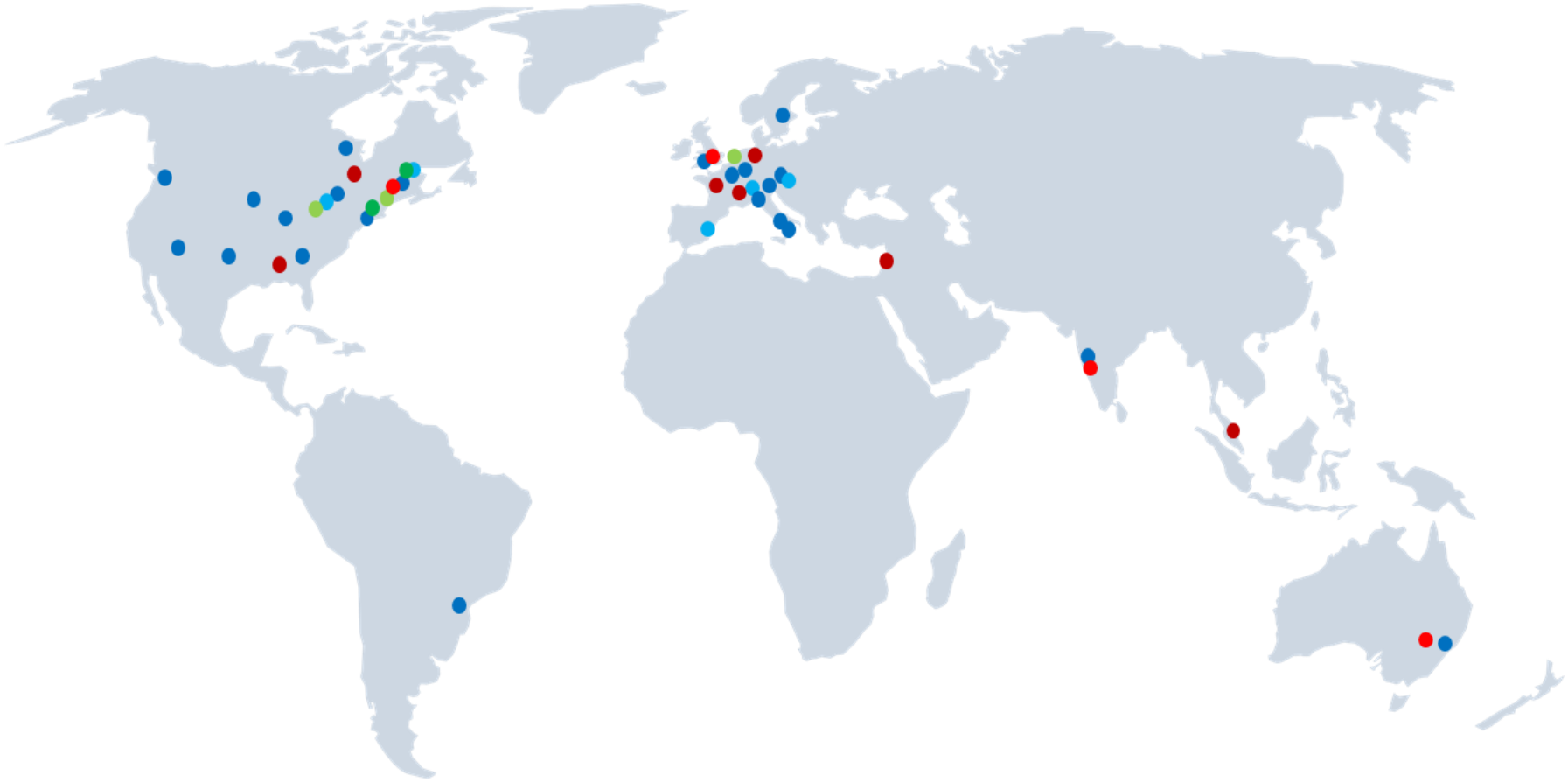
NEW CHALLENGES
MULTIDISCIPLINARY EDUCATION

All over the world,
you can find training courses
training courses related to:

- **Hospital Planner**
- **Medical Planner**
- **Doctor Architect**
- **Doctor Engineer**
- **Nurse Engineer**
- **Nurse Architect**



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NEW CHALLENGES FOR DESIGN & HEALTH LAB: WHO EXPERT MEETING

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WORLD HEALTH ORGANIZATION
REGIONAL OFFICE FOR EUROPE

WELTGESUNDHEITSORGANISATION
REGIONALBÜRO FÜR EUROPA

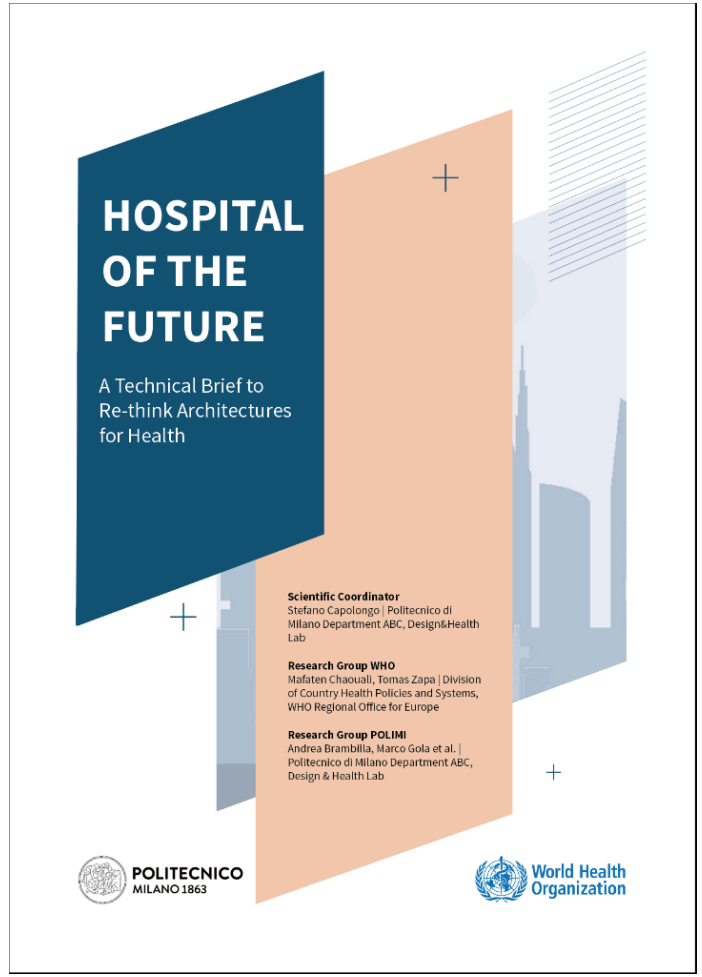
ORGANISATION MONDIALE DE LA SANTÉ
BUREAU RÉGIONAL DE L'EUROPE

ВСЕМИРНАЯ ОРГАНИЗАЦИЯ ЗДРАВООХРАНЕНИЯ
ЕВРОПЕЙСКОЕ РЕГИОНАЛЬНОЕ БЮРО

Expert meeting
Rethinking the future of Hospitals in the European Region
Brussels, Belgium
14-15 December 2021

/5

23/11/21
Original: English



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NEW CHALLENGES FOR DESIGN & HEALTH LAB: NEXT GENERATION HEALTHCARE LAB @ MIND

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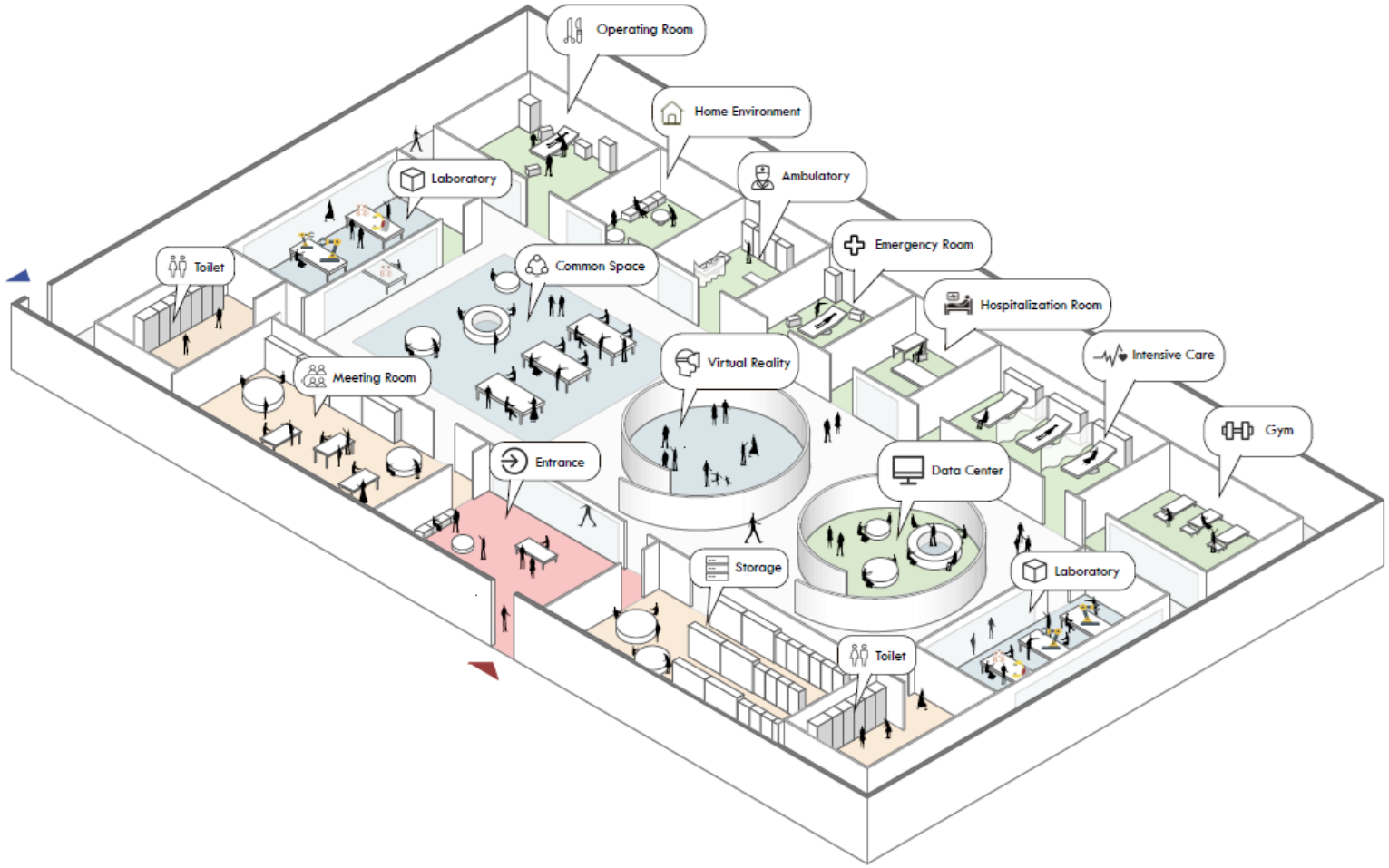

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NEW CHALLENGES FOR DESIGN & HEALTH LAB: JRP HEALTHCARE INFRASTRUCTURE

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Joint Research Platform
Healthcare Infrastructures

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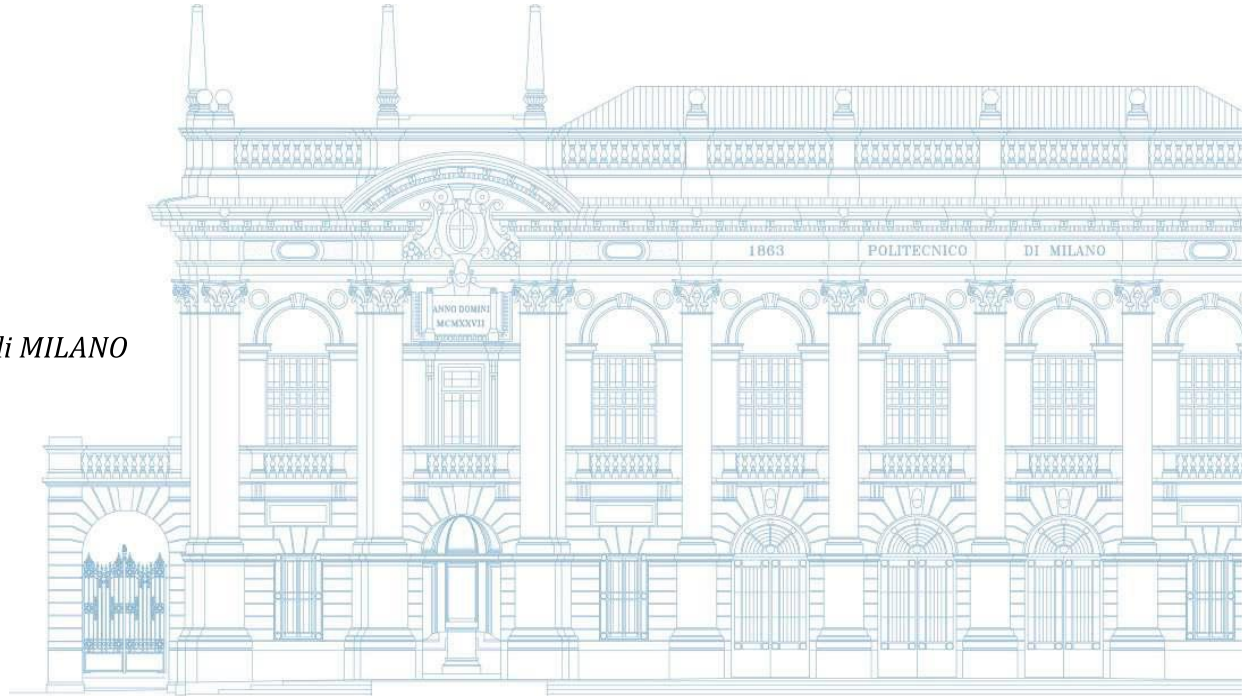
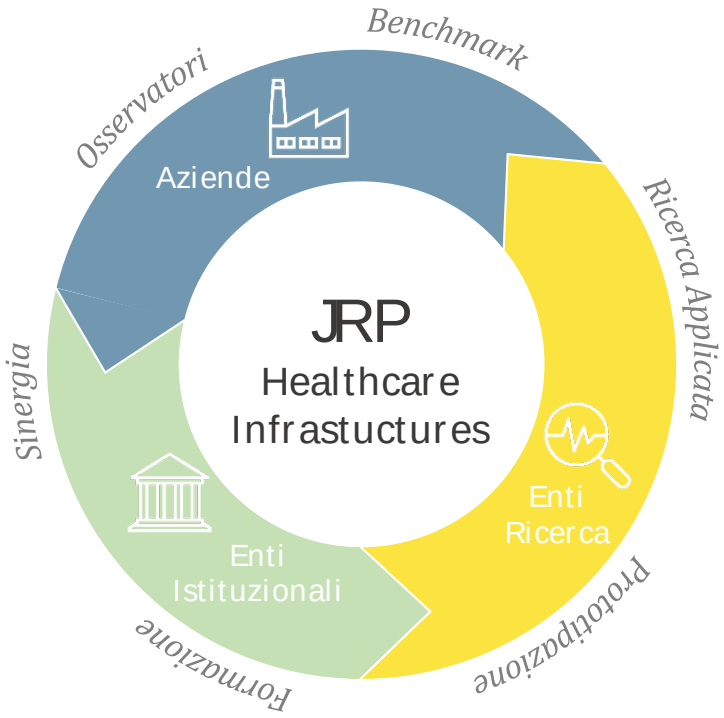
Fondazione Politecnico di Milano

Ferruccio Resta
Rettore
POLITECNICO DI MILANO

Andrea Sianesi
Presidente
FONDAZIONE POLITECNICO di MILANO

Stefano Capolongo
Design & Health Lab
Direttore Dipartimento ABC
POLITECNICO DI MILANO





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CONGRESSO BRASILEIRO PARA O DESENVOLVIMENTO DO EDIFÍCIO HOSPITALAR
CONEXÃO E DIVERSIDADE NOS ESPAÇOS DE SAÚDE

Centro de Convenções de Pernambuco - Auditório
Eixo 2 - Pandemias e epidemias: desafios e oportunidades.
Conferência 2 on Thursday 20th October 2022, 18:15 - 19:15

Título do trabalho:

HEALING ARCHITECTURE: the experience based approach for re-thinking the Next Generation Hospital

Stefano Capolongo

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President of the Italian Center for Hospital Building and Design [CNETO]
President of the “Urban Public Health” of the European Public Health Association [EUPHA]
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