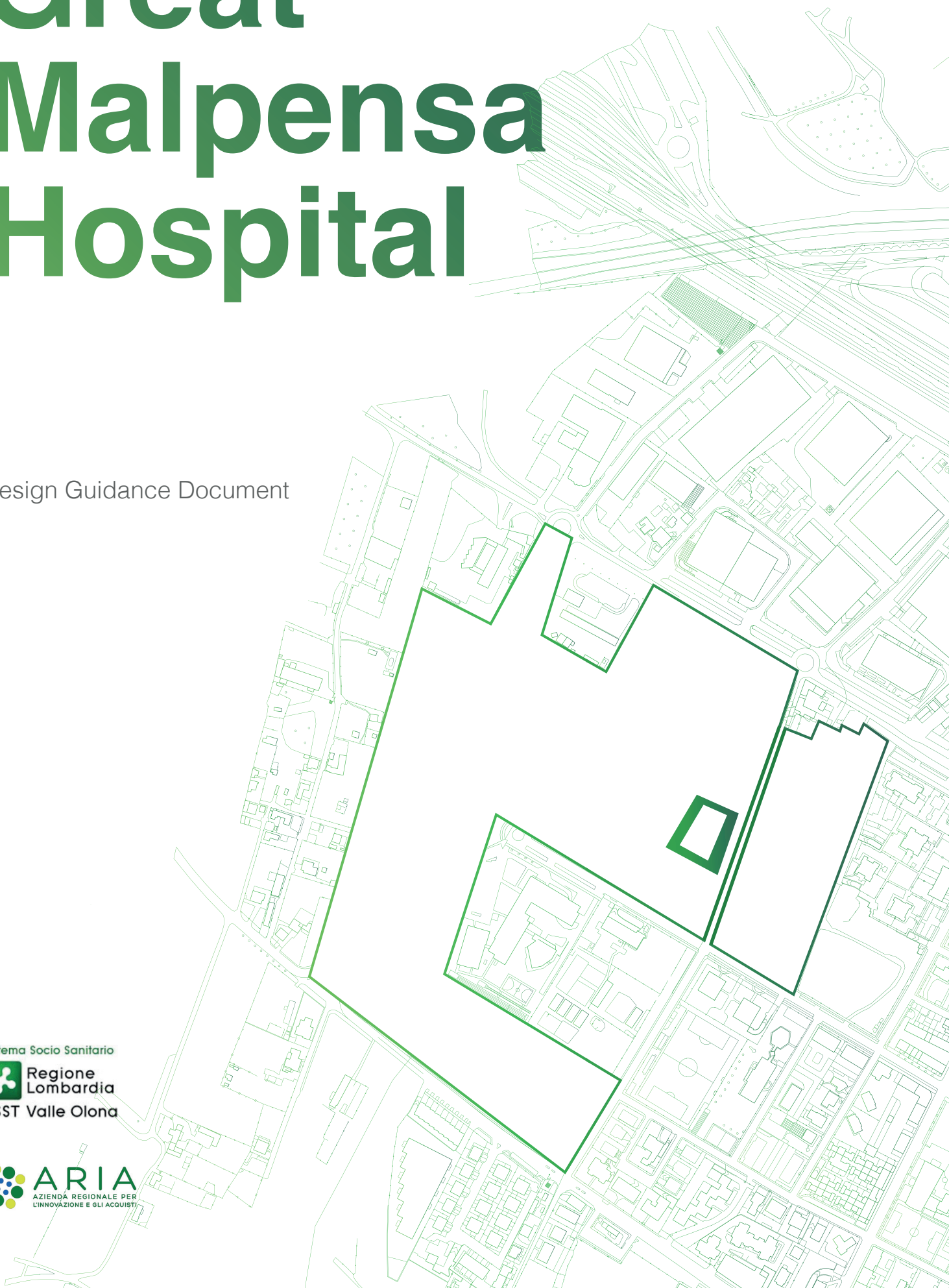
Great Malpensa Hospital

Design Guidance Document



Sistema Socio Sanitario
Regione Lombardia
ASST Valle Olona

ARIA
AZIENDA REGIONALE PER L'INNOVAZIONE E GLI ACQUISTI

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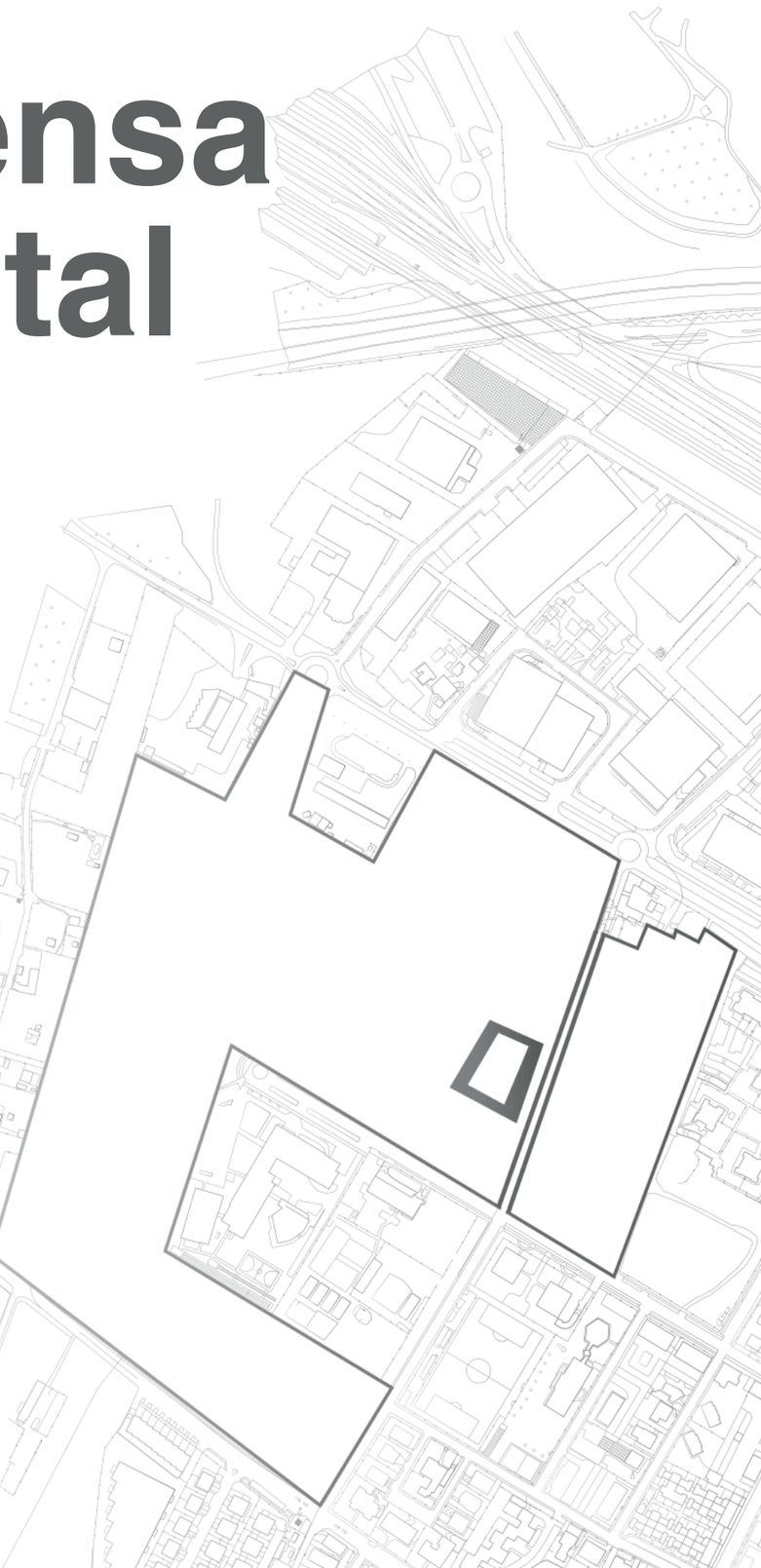

Sistema Socio Sanitario
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AZIENDA REGIONALE PER L'INNOVAZIONE E GLI ACQUISTI

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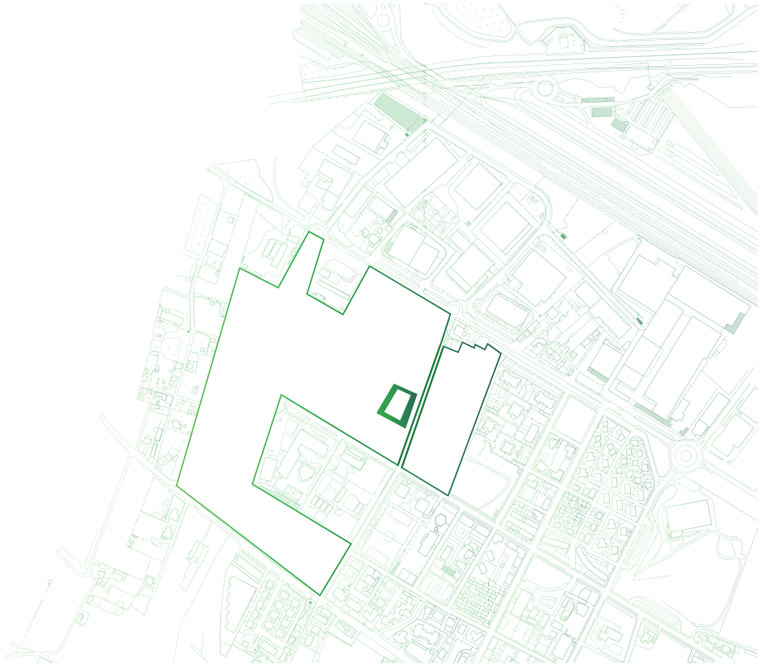
The purpose of this document is to provide indications and guidelines for participation in the international design competition for the *Great Malpensa Hospital.* The content of the document is intended for use only for the project design competition described, and must not be used for other purposes.

The design references and images contained in the document are intended as a thematic and informative cue for designers for the sole purpose of participating in the competition. The evaluations of the guiding committee will not favour a design or formal affinity to the above references.

This Design Guidance Document should be understood as a translation of the document from the Italian official version. This English version has been provided to facilitate the understanding of the content for international designers. In case of any discrepancies or uncertainties, the official Italian version shall prevail as the primary reference.

Aerial view of the Busto Arsizio Municipality

Foreword



As planned by the Valle Olona Local Health Authority (LHA) , the intervention consists in constructing the New Hospital of Busto Arsizio and Gallarate called "**Great Malpensa Hospital**" in the northernmost area of the Beata Giuliana district of Busto Arsizio, bordering with the Gallarate Municipality, as identified by the Lombardy Region.

This Design Guidance Document (DIP) has been drafted in accordance with the requirements defined considering the implications identified with solutions proposed in the Feasibility Document of Design Alternatives (DOCFAP), the requirements in the Strategic Environmental Assessment (SEA) and Programme Agreement (AdP) as well as the requests and objectives stated in the regional plan.

The DIP also presents the main evolutionary orientations of health-related architectures in the form of performance requirements supported by converging best practices and scientific literature into an Evidence & Practice-Based approach.

In terms of size, specific type and category of the intervention to be carried out, this document indicates the characteristics, performance requirements and design drawings required to define the particular design levels.

The design of the New Hospital faces the challenge of meeting the main social, epidemiological and demographic requests by turning major global trends into functional, spatial and technological features, interpreting the occasion as a laboratory of experimentation and innovation for a prototype of the Hospital of the Future.

The implementation of evaluation strategies and tools will allow to monitor over time the trend of various performance characteristics, such as flexibility, sustainability or social inclusion, ensuring high quality design, architectural and strategic solutions for the infrastructure.

The information contained in the document is an intrinsic part of both the “design service specifications” and the tender documentation to award the public service contract.

Aerial view of the Gallarate Municipality

Contents

Introduction

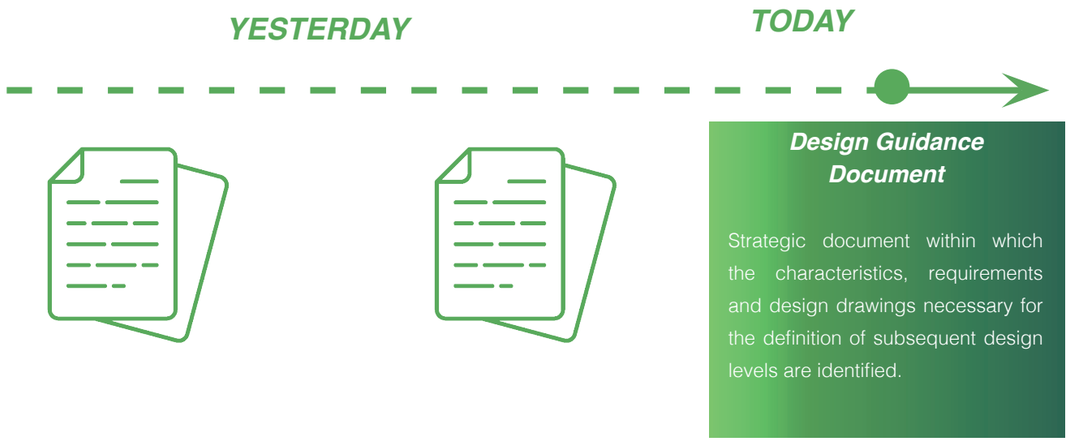
This chapter describes the evolution of the design process in defining the Design Guidance Document for the New Hospital, supported by guidance on the benefits of using guidelines and technical briefs for future-oriented hospital design.

Evolution of the design process

The Valle Olona LHA operates in a territory divided into 3 Social-Medical Districts: Busto Arsizio (Districts Busto Arsizio and Castellanza), Gallarate (Districts Gallarate and Somma Lombardo) and Saronno. About 437,000 patients of the wider population of the Insubria LHA belong to it. The catchment basin of the Busto Arsizio-Gallarate area amounts to about 200,000 users.

In this demographic context there is a call for structural and logistical renewal of the hospital area, based on the regional plan that reshapes intra-hospital and hospital-territory paths. The need to redevelop the hospital as a place that responds to acute health needs is, therefore, emphasised, where every citizen is guaranteed a rapid, quality diagnostic path, while respecting their privacy, and maintaining their safety. The planning of each case and then implementation amongst the territorial management allows for complete functional recovery. These premises have led to the design path for the New Hospital of the cities of Busto Arsizio and Gallarate, hereinafter referred to as the Great Malpensa Hospital:

1. In 2019, the Programme Agreement (AdP) for the construction of the New Busto Arsizio and Gallarate Hospital was promoted with Regional Council Decree no. XI/1166 of 21 January 2019 (BURL SO no. 5 of 31/01/2019). Hence, the Strategic Environmental Assessment (SEA) procedure was formally initiated for the urban transformation of the old hospital premises and their enhancement.
2. In 2021, the Preliminary Design Document (DPP) was drawn up, carried out internally within the Hospital, with the aim of defining the organizational and functional needs and requirements of the Great Malpensa Hospital.
3. Regional Council Decree no. XI/6018 of 1 March 2022 “Determinations regarding the construction of the New Hospital of Busto Arsizio and Gallarate” promoted the Programme Agreement to construct the New Hospital in Beata Giuliana, in the Municipality of Busto Arsizio, and initiated the related SEA procedure.
4. ASST Valle Olona and ARIA SPA on 22 March 2022 signed the contract “New Hospital of the cities of Busto Arsizio and Gallarate”, entrusting ARIA S.P.A. with the task of Central Client for the preparation and drafting of the project documents aimed at approving and signing the new Programme Agreement for the construction of the New Busto Arsizio and Gallarate Hospital.
5. The Feasibility Document of Design Alternatives (DOCFAP) is then defined, and with Regional Council Decree no. 1112 of 16/10/2023, the Programme Agreement (AdP) is signed on 24 October 2023 by the Lombardy Region, the Province of Varese, the Busto Arsizio Municipality, the Gallarate Municipality, the Local Health Authority (ASST) of the Olona Valley, the Health Protection Agency (ATS) of Insubria, confirming the development of the New Hospital in the area now subject to the tender.
6. This important decision

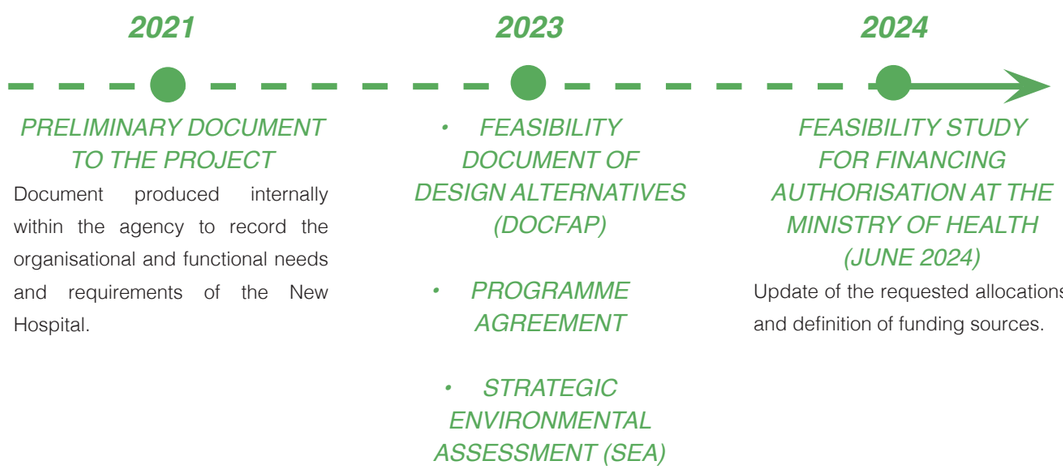


is followed by the realignment of the investment programme under Regional Council Decree no. XI/5835/2021 and Regional Council Decree no. XI/378/2023 with relative approval of the interventions.

7. The Feasibility Study (SdF) for Financing Authorisation at the Ministry of Health was completed in June 2024, and the required endowments were updated accordingly and funding sources were defined.
8. This Design Guidance Document (DIP) is preparatory to starting the Technical and Economic Feasibility Plan (PFTE).

The Design Guidance Document (DIP) plays a crucial role in designing a new hospital complex, providing the strategic, functional and technical foundations necessary to address the complexity of a modern healthcare facility. This document guides the design process by defining the main requirements, the functional relationships between the different areas, and the organisational criteria that must guide each phase of the project, from initial conception to implementation.

The Programme Agreement is approved in accordance with the procedures and with the effects provided for by art. 7 of Regional Law 29 November 2019, no. 19 “Discipline of negotiated programming of regional interest”.



Annexes to the DIP consist of:

Annex 1 - General plan of the intervention area and identification of the scope of the Programme Agreement (AdP)

Annex 2 – General Report – Feasibility Study

Annex 3 – Excerpt from the DOCFAP

Annex 4 – Accessibility – Infrastructural works to support accessibility

Annex 5 - Environmental Report and non-technical summary

Annex 6 – Reasoned SEA opinion (Decree no. 6665 of 08/05/2023)

Annex 7 - Summary Statement

Annex 8 – Timetable for implementation of the works

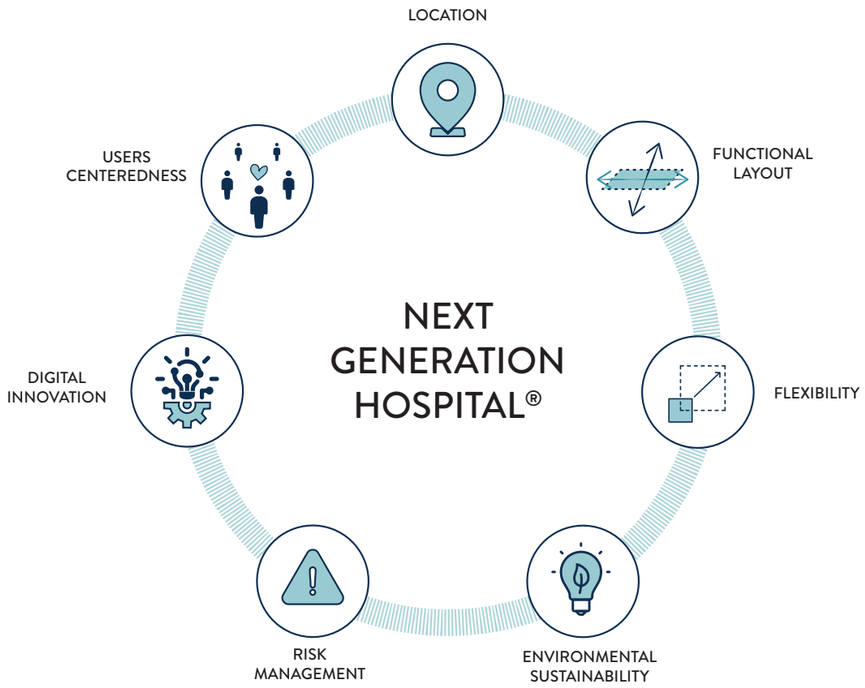
Annex 9 - Technical Economic Framework

Annex 10 – Compensation charges and initial indications for works

Annex 11 – Land registry plan.

The documentation related to SEA and AdP is available at the Lombardy Region, and is available on the website https://www.sivas.servizirl.it.

Guidelines for the Hospital of the Future



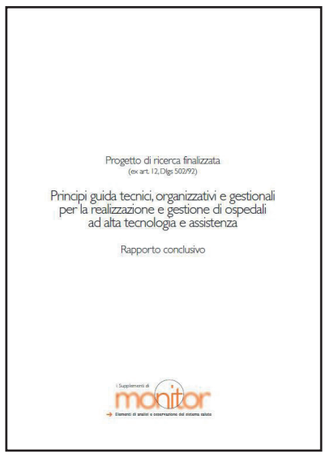
The Next Generation Hospital - Requirements for the Hospital of the Future

The Project Design Document (DIP) was defined by using some of the most important international theoretical references for the design of new hospitals with the aim of aligning the project with best practices and global innovation. The adoption of technical documents and guidelines allows to optimise the project, introducing advanced solutions both from a functional and managerial point of view, in response to the current and future needs of an evolving healthcare system.
The main document used to guide strategies and design requirements is the Technical Brief: Hospital of the Future, published by the World Health Organisation (WHO) in 2023, prepared with the support of the Design&Health Lab, Politecnico di Milano.

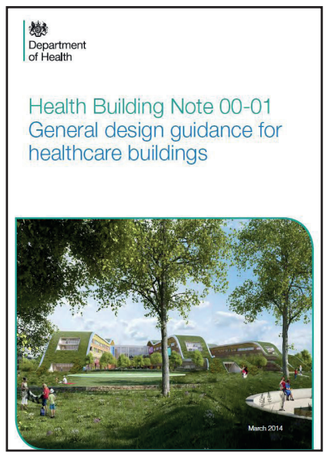
This document provides an innovative vision for the hospitals of the future, presenting the key functional and performance characteristics for a future-oriented hospital.
In addition to the WHO document, other relevant institutional references and sources of technical-scientific literature representing design models of excellence at national and international level were consulted. Among these it is important to mention:

- The **Metaproject**, reported at the Finalised Research Project - Technical, Organisational and Management Guiding Principles for the Construction of High-Tech Hospitals and Care, and regulated by Ministerial Decree 12/12/2000. An innovative Italian model that integrates criteria of humanisation, functional features and sustainability in hospital design.

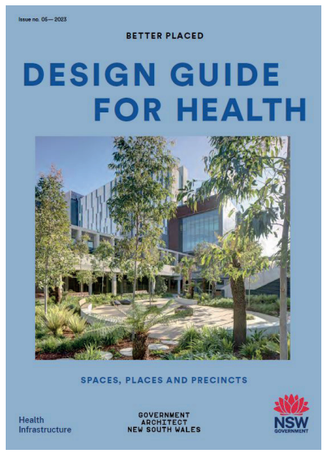
- The different contributions defined by the **NHS Health Building Notes**,



Meta project, Targeted Research Project



NHS Health Building Notes



Design Guide for Health, NSW Government of Australian Regions

Technical Brief Hospital of the Future

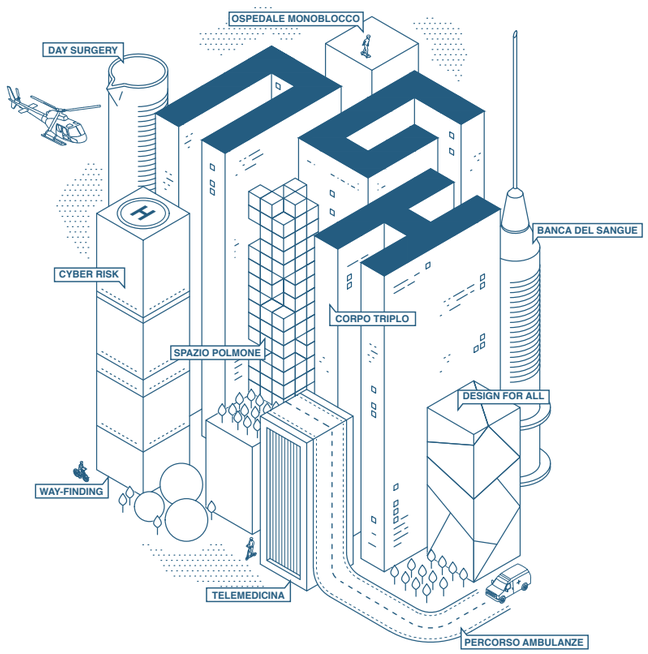
The Next Generation Hospital JRP HI Annual report 2022

The Next Generation Hospital JRP HI Brief Annual report 2023

developed by the British healthcare system, which provide guidelines for the planning and design of different hospital areas, with a strong focus on flow efficiency, safety and space optimisation.

- **Design Guide for Health developed by the NSW Government of the Australian Regions**, which provides detailed guidance for hospital design with an approach based on technological innovation and operational efficiency.
- **The Next Generation Hospital, Metadesign Requirements for the Hospital of the Future: Functional Model, Performance Model and UNI Terminology**, developed by the Joint Research Partnership Healthcare Infrastructure (JRP-HI) of Politecnico di Milano. A multi-actor research platform aimed at institutions and companies operating in the Healthcare & Life Science sector. The JRP HI platform develops and tests the evolutionary strategies of design, technological, organisational, construction and management innovation, which contribute to increasing the competitiveness, efficiency and effectiveness of existing models with respect to the transition of healthcare from an exclusively hospital-centred scenario to a sustainable user-centre perspective, within a physical and digital territorial network.

Together these references have allowed to build a solid methodological basis for the DIP, ensuring that the design of the New Hospital complies with international standards, capable of responding to contemporary technological and organisational challenges, and promoting sustainable, humane and patient-centred healthcare.



1

Physical and Planning Context

This chapter summarizes the urban planning framework of the intervention area, clarifies the drivers of medical planning together with the numerical endowment of the hospital. It identifies the evolutionary principles of health architectures by defining the state of the art for the new intervention.

1.1
Urban planning framework

Satellite image with identification of intervention area

Design Area

The project strategy chosen in the DOCFAP (July 2023) envisages the construction of a New Hospital in a vacant area in Beata Giuliana, north-west of the municipal territory of Busto Arsizio, on the border with the Gallarate Municipality. The New Hospital will have to be designed to accommodate beds resulting from the reorganisation of the two main hospitals. The satellite image shown highlights the area identified by the Programme Agreement for the construction of the New Hospital in relation to the main connecting roads, the two towns and the location of the existing hospital in Busto Arsizio.

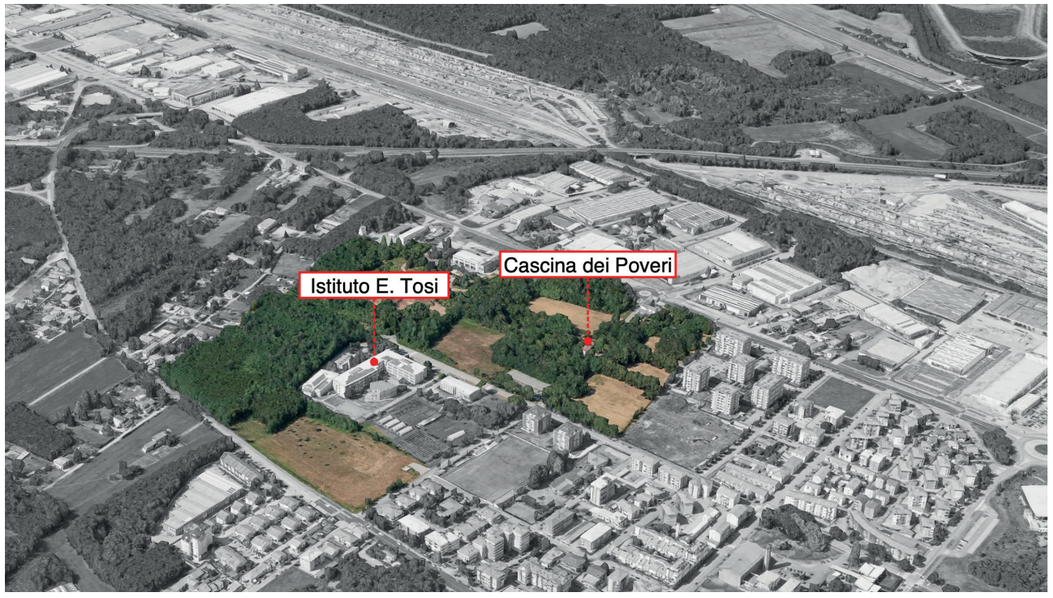
The project is located within an area of significant landscape relevance, along a corridor of the regional ecological network, on the edge of the Ticino River Park. The area is characterised by the presence of extensive woodland and a building of historical architectural interest bound by Legislative Decree 42/2004. These features require a sensitive approach from a landscape point of view to insert the new hospital sector, preserving and implementing the ecological and landscape characteristics of the site. The project area is also located in a largely infrastructural urban context, accessible from A-roads SS33 and SS336 that connect Milan to Malpensa airport. A new A-road SS341

Satellite photo of the project area

(the “Gallaratese”) is planned to the north of the area. The area is adjacent to the Busto Arsizio – Gallarate Fire Brigade unit, and is about 1.5 km from the former Milan air force barracks complex where the Vaccine Centre managed by the Valle Olona LHA is currently located.

Planning and urban planning

According to the forecasts of the PGT of Busto Arsizio, the construction of a new hospital in the Busto Arsizio Municipality, in Beata Giuliana, is carried out on an area to be used as services; therefore, the aforementioned intervention continues the plan’s guidelines.
Its implementation requires the acquisition of two areas subject to a private ownership regime.
For the identification and methods of acquisition of the aforementioned areas, please refer to Tables A.19 “Areas subject to equalisation” and B.4 “Design framework” of the PGT, and the cadastral statement contained in the Urban Annex.
The construction of the new hospital complex involves land consumption, as well as interference with landscape areas and the existing ecological network



Satellite image with identification of intervention area and significant existing facilities

due to forest transformation interventions recognised by the PIF. Such interference would require appropriate compensatory measures.
It also highlights the presence of buffer bands forced by the passage of the network of SNAM pipelines and medium voltage power lines. Strict constraints (pursuant to Legislative Decree 42/2004) also exist on the Cascina dei Poveri and the area pertaining to it (gardens). The intervention must be carried out in full respect of the building and its typical characteristics, as well as the functions provided for in it. In particular, any form of demolition or structural modification is prohibited, but initiatives aimed at restoring site functions and enhancing it are encouraged.

Constraint and protection system (environmental, historical, archaeological and landscape constraints)

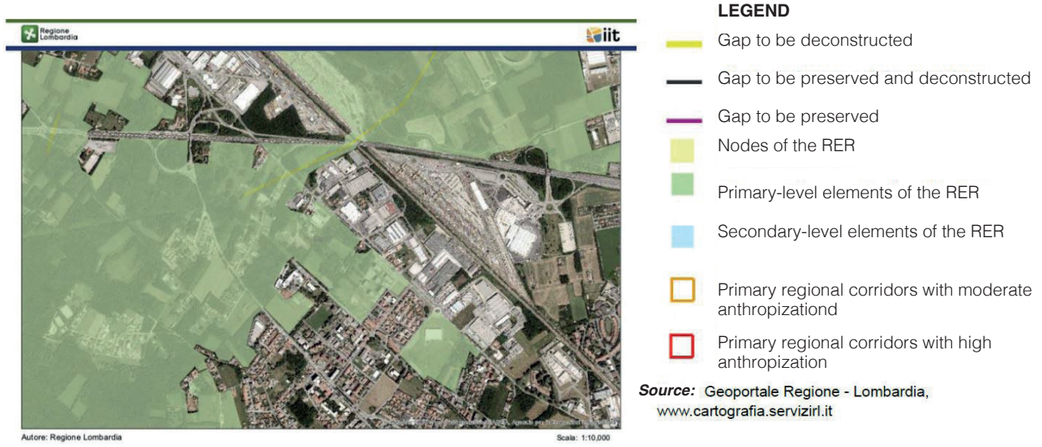
The following is an analysis of the system of environmental and landscape constraints that interact with the project scope in the Beata Giuliana area, in order to assess the consistency and conformity of the project strategies

CADASTRAL EXTRACT AND PROPERTY STATUS

The areas designated for the construction of the Grande Ospedale della Malpensa are identified in the land registry of Busto Arsizio, within the censuary section of Busto Arsizio (logical sheet no. 9, specific sheet no. 4).
The occupied areas cover a total cadastral surface of 167,996 sqm, distributed as follows:

-151,676 sqm owned by the Municipality of Busto Arsizio;
-11,480 sqm jointly owned by the Municipalities of Busto Arsizio and Gallarate;
- 4,840 sqm owned by third parties.

Land registry statement of the area and condition of the properties

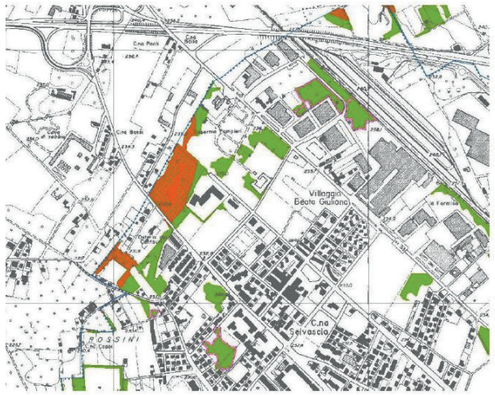


Forestry Plan of the Province of Varese.

proposed in this chapter with the planning framework at the regional, provincial and municipal scale. In particular, with reference to the R.E.R. - Regional Ecological Network (Regional Council Decree no. VIII/10962 of 30.12.2009):
It should be noted that the northern area of theBusto Arsizio Municipality is included in the RER, natural and environmental infrastructure on a regional scale, which pursues the aim of connecting territorial areas with a greater presence of nature by protecting, enhancing it to the increase of biodiversity and ecosystem functionality of the existing heritage.
The area identified for the construction of the new hospital complex falls within Sector 31 of the RER - 'Boschi dell'Olona e del Bozzente' [Olona and Bozzante Woods], an important sector connecting the Lombard Park of the Ticino Valley and the Regional Park of the Appiano Gentile e Tradate Pinewood, thanks also to the presence of relict wooded units largely protected by the Local Park of Supracommunal Interest (PLIS). The whole area is permeated by a dense urban matrix and a network of linear infrastructures that fragment its ecological continuity, in particular the A8 motorway and the A-road SP233.
The Plan Document provides the following indications for implementation of the Regional Ecological Network in the reference sector:

- To promote, in general, the creation of new ecosystem units and ecological defragmentation interventions, which increase connectivity to the North East with the Pinewood Park; to the West with the Ticino Park; to the East with the Groane Park, and to the South with the North Milan Green Axis.
- Provide mitigation and environmental inclusion works for projects of works that can increase ecological fragmentation.
- Provide defragmentation works for the A8 and A8-A26 motorways, the A8 Malpensa expressway and the A-road SP233.

From the plan excerpt reported, it is evident that the project area is located near a “gap to be defragmented” and included within the “First level elements” of the RER. In these areas, transformations that could compromise existing natural conditions and/or ecosystem functionality should be avoided. If local planning recognises undoubted social importance, transformations in these sensitive areas can only be achieved by providing for naturalistic compensation interventions, to be carried out on the same element of the Network.
Interventions located within a primary corridor shall also ensure that a cross-section of not less than 50% of the section provided for by the RER remains permeable.



Non-transformable forests for ordinary transformations for urban purposes.

The presence of forests on a high surface percentage of the intervention area requires a comparison with the Forestry Plan of the Varese Province. As a tool for the enhancement of forestry-pastoral resources, it is configured as a sectoral plan of the Territorial Plan of Provincial Coordination (PTCP) and, therefore, complies with the requirements, directives and guidelines dictated by it, linking forest planning and territorial planning policies.

Under Art. 43, paragraph 2 of Regional Law 31 of 5 December 2008, forest transformation interventions are prohibited, subject to the authorisations issued by the Province, for the area of competence, compatible with the conservation of biodiversity, soil stability, water regime, landscape protection, windbreak and local environmental hygiene.
Any request for transformation of the forest must be supported by a specific detailed forest and environmental report, possibly also showing the compensation works, the final project of the works (including activities to recover the natural value of the places and the compensation works) and, if necessary, by a specific geological and hydrogeological report of deepening the territorial aspects.
The Forestry Plan (FIP) identifies in Table no. 9 “Charter of permitted transformations” the wooded areas with a prohibition of transformation for urban purposes. As can be seen from the plan excerpt, the project presents three types of classification of wooded areas.
According to the provisions of the Technical Implementation Standards (NTA) of the PIF of the Province of Varese, the following are permitted: in woods that cannot be transformed for urban planning purposes:

- special forest transformations, where they have a low environmental impact;
- public works not otherwise located;
- area-based transformations, limited to the areas identified in Table no. 9 “Map of permitted transformations” with dedicated dashed lines, without buildings of any kind.

Under Art. 29 of the NTA, the issue of authorisations for transformations for urban purposes takes into account the ecological and functional values of the forest (structure, form of government, forest type, functional attitude), with particular attention to the forest types present and the elements of value identified during the analysis and summarized in the maps of the value of destinations indicated by the PIF for the forest areas subject to transformation request.
If the need to proceed with forest transformations for urban planning purposes is identified, the following shall be provide for in the project documents in order to be compatible with the PTCP, namely the report certifying the non-existence within municipal boundaries of alternative areas to those envisaged for the implementation of the intervention involving transformation and identification of compensatory measures prepared in accordance with the indications of the PIF, and the areas to be used for the execution of the same within the municipal boundaries.

Transformable forests – areal-type transformations

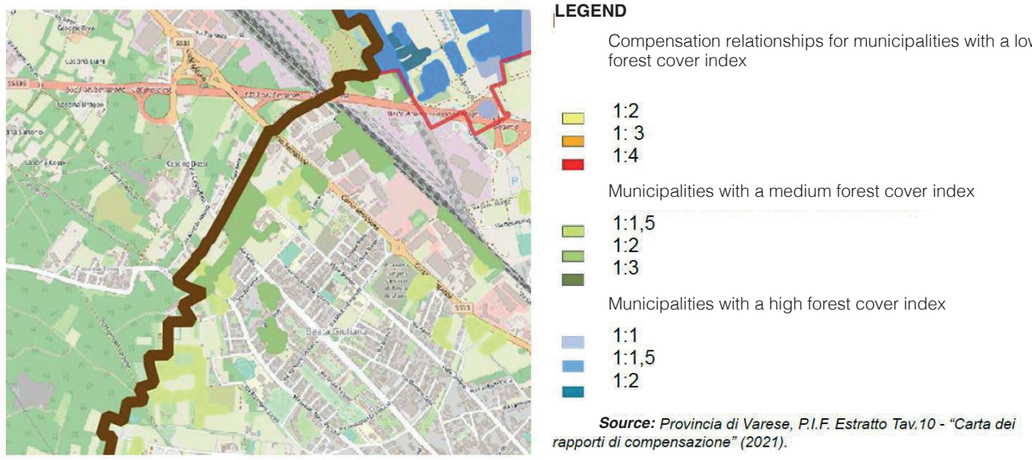
For this category, transformations aimed at agricultural activity, and possibly the construction of rural buildings closely related to the exercise of the agricultural activity itself, included in the PGT in agricultural areas, are preordained to the cultivation of woodland. The permits are issued up to a maximum of 20,000 square meters and must not involve transformation of the following types of forest, considered valuable: oak and / or english oak groves, Turkey oak groves, oak-hornbeam groves, lowland forests of alder and Scots pine.

Woodland

The authorisations granted for the transformation of woodland provide for compensatory measures to be borne by applicants, aimed at the redevelopment of existing forests and in proportion to the compensatory ratio attributed to the forest. The choice of areas for compensatory intervention must be made on the basis of indications contained in the Compensation Charter.

Compensation

The NTAs of the Province of Varese PIF define the possible compensatory interventions for each category of forest coefficient attributed to each municipality covered



Government Plan of the Territory - Municipality of Busto Arsizio

by the Plan, as illustrated in the plan excerpt below. The Municipality of Busto Arsizio falls within the areas with a medium coefficient of woodland (between 15% and 40%), where the following are identified as compensatory interventions: reforestation and silvicultural activities;
Based on the indications contained in art. 34 of the NTA, it is considered possible to recognise in these areas also compensatory projects concerning the improvement of existing forests including hydraulic-forestry arrangements capable of enhancing the protective function of forests. The following compensatory ratios are provided within the intervention area, as reported in the extract of the Territorial Government Plan.

Local and supralocal constraints

The analysis of the existing constraints on the municipal territory represents the set of protections and safeguards present in the municipal territory. In the specific case, the following constraints have been identified, illustrated in "Table A13 - Supralocal and local constraints":

- Woodland areas;
- Ecological network;
- Asset of historical and artistic interest subject to the constraint of Legislative Decree 42/2004.

The scope of intervention includes an asset of historical and artistic interest called "CASCINA DEI POVERI". This artefact, protected by the aforementioned law, may not be destroyed, deteriorated, damaged or used for uses that are not compatible with its historical or artistic character or that may prejudice their conservation. Removal or demolition, even with subsequent reconstitution, is subject to authorisation from the Ministry of Cultural Heritage. For this building, the PGT allows building interventions aimed at recovery, renovation and reuse of the rural complex and its open spaces, subject to the preparation of an implementing urban planning tool. Furthermore, according to the Plan of Rules and as reported in art. 18, for these buildings, the interventions are aimed at enhancing the aspects of interest and value, not only historical and testimonial, related to the artefacts, but also and above all ecological-environmental, related to the green spaces of relevance, through interventions of conservation and increase of the existing vegetation.

- SNAM pipeline: The route of the pipeline cuts through the area south of Via Cascina dei Poveri. Along the methane gas supply pipelines there is a buffer zone of variable depth where the construction, reconstruction of buildings or artefacts of any kind is prohibited. The depth of the buffer zone will be verified with the managing body. The exact route of the pipeline will be provided in the next design phase through a georeferenced instrumental survey. This will allow proper insertion of the plan and correct configuration of the multi-storey car park dedicated to the envisaged staff in the area adjacent to via Cascina dei Poveri.

The study area intercepts the scope of redevelopment 8 - Redevelopment of the Sempione Axis, which crosses the northern fabric of Busto Arsizio from northwest to east. This area is strategic as a hinge element between the various urban systems, on the one hand the linear park that reconnects the city fabric (La Spina Verde), on the other the axis of strategic importance for the local economic system. The objectives of the redevelopment areas include revitalisation of environmental systems as a precondition and ordering principle for the redevelopment of the settlement system, and also the redevelopment of the most degraded or environmentally unresolved urban neighbourhoods.
The Sempione axis is the historical axis of territorial connection along which production and commercial activities have been consolidated over time. At present, it is characterised by an uneven supply, the presence of timely critical issues and the lack of a unitary project. The redevelopment of this area aims to increase the attractiveness and quality of the offer at territorial scale, safeguarding the high profile production vocation.
In the sheets of the processing areas, the land index is 1 sq.m./sq.m, and a 10% increase in the maximum SLP can be assessed, based on specific criteria.
The Service Plan, based on the provisions contained in art. 9 of Regional Law 12/05 and the strategies set out in the Plan Document, develops the aspects relating to the state of public services and public use, and finalises the design of the new service system in relation to the needs that have emerged, the development and redevelopment of the

LEGEND

Environmental constraints

Forested Areas

Ecological Gap

Ecological Network

Anthropic Constraints

Cultural and Historical Assets Subject to Protection (Legislative Decree 42/2004)

Infrastructure Constraints

SS341 Variant and “Gallarate Bypass”

Protection Buffer Zone pursuant to Article 102bis of Regional Law 12/05

Natural Gas Pipeline (SNAM)

Source: PGT Comune di Busto Arsizio, Estratto Tav.A13 - “Vincoli sovra locali e locali” (2013).

Government Plan of the Territory - Municipality of Busto Arsizio

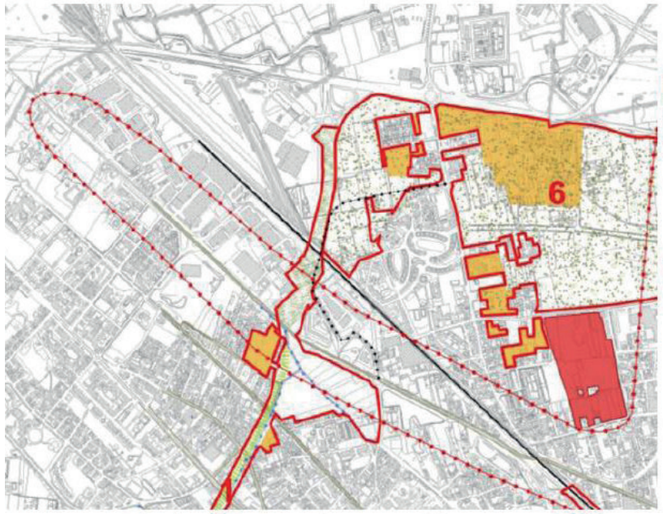
settlement system, and the economic resources made available by the public administration.

The scope of intervention is zoned among the “Projected Service Areas” governed by the Service Plan. It mostly comprises areas already owned by the Municipality. Specifically, the area is intended to host ‘functions and activities of supra-municipal interest’ and ‘services of a strategic nature’, compatible with the project proposal under study.

The scope of intervention includes within it areas classified according to the excerpt of the Plan of Rules "Charter of landscape sensitivity" below, as areas with "high" and "very high" landscape sensitivity, corresponding with the woodland and agricultural areas.

The Plan of Rules, Art. 52. “Classification of the municipal territory according to the sensitivity of the places” excludes from classified areas 4 and 5 (high and very high sensitivity) new buildings that by location can compromise perception of the environmental qualities of the context, visual cones and, in general, the landscape qualities of the places, and significantly reduce the surrounding green spaces.

Renovations of buildings, extensions, new constructions or road works and the like located in areas with medium landscape sensitivity, (class



LEGEND

Transformation Areas:

1 Green Spine

6 Busto Nord

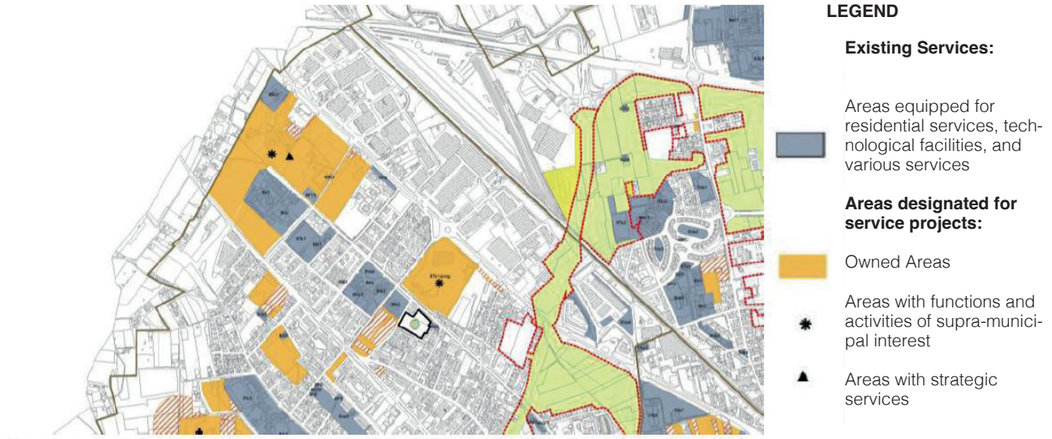
Redevelopment Areas:

8 Redevelopment of the Sempione Axis and Connection 336

Source: PGT Comune di Busto Arsizio, Estratto Tav.A16 - “Scenario di Piano” (2013).

Government Plan of the Territory - Municipality of Busto Arsizio

3), or placed at a distance of less than 50 m from the perimeter of areas classified with very high landscape sensitivity (class 5) or high (class 4), located along the scenic views or that may obstruct optical cones or scenic points identified by the Landscape Plan, are subject to verification of the degree of landscape incidence of the project, pursuant to art. 30 of the rules of the Regional Territorial Plan, pursuant to Regional Council Decree no. 7/11045 of 8/11/2002 and Regional Council Decree no. 9/2727 of 22 December 2011.



PGT Comune di Busto Arsizio – Piano dei Servizi, Estratto Tav. B4 - "Quadro Progettuale" (2018).

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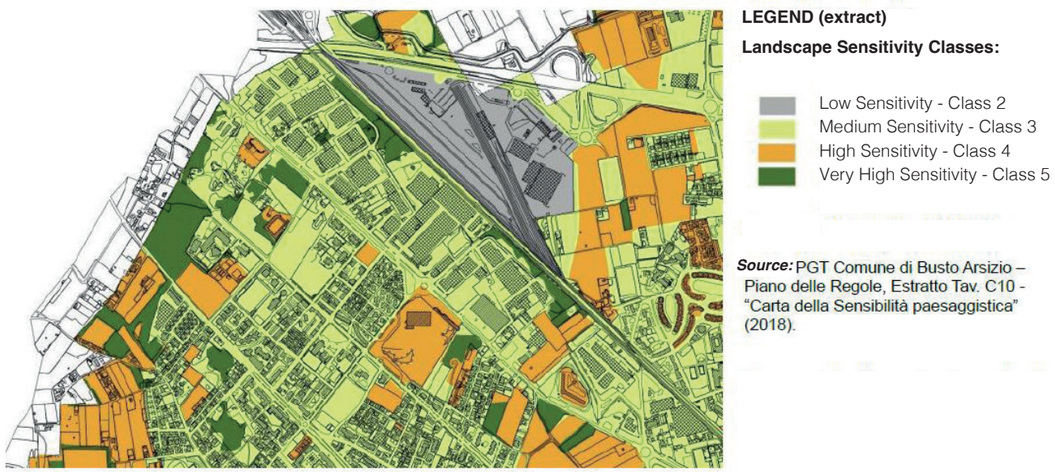


Source: PGT Comune di Busto Arsizio – Piano delle Regole, Estratto Tav. C10 - "Carta della Sensibilità paesaggistica" (2018).

Government Plan of the Territory - Municipality of Busto Arsizio.

Vegetation and connections system (source: DOCFAP)

Interference with respect to constraints

The construction of the New Hospital is complex with regard to interferences with constraints related to the historical and architectural heritage, landscape sensitivity, woodland areas and the ecological network.
In particular, the New Hospital is located in an area that houses the Cascina dei Poveri, a building of high historical value that is widely recognised by the local community. The scope also includes transformation of a part of the forest recognised in the Forestry Plan. These critical issues will subsequently be evaluated in greater depth from the point of view of possible mitigations and compensations, in order to verify their eligibility and feasible resolution through project design.

The Great Malpensa Hospital is configured as a hinge between environmental systems and urban nuclei of great value.

1.2 Medical Planning

Current hospital facilities

The Great Malpensa Hospital will be built to replace the current hospital facilities belonging to the Valle Olona LHA, namely the hospital facilities of Busto Arsizio and Gallarate.

The Busto Arsizio Hospital is today a building complex that has seventeen built volumes, of different sizes and styles, connected by an underground system that fulfils the need to transfer inpatients and all the necessary hospital services.

The state of current consistency of the building stock of the hospital available to the Valle Olona LHA is reported in tabular form. The total area of almost 99,000 sq.m is divided between the various buildings:

Central Building - Built around 1915, it houses the "heavy" services such as Radiotherapy, the various management and administrative offices, polyclinics, the Nuclear Medicine Department (PET, hospital stays), Radiology, including interventional, Dermatolgia, Nephrology with Dialysis, Child Neuropsychiatry, and Audiophonology.

n.	Building	n. floors	Surface (SLP)
1	Polichirurgico	11	27.090,67
2	Portineria cup	1	986,83
3	Servizi	4	4.460,41
4	OGP	7	11.817,94
5	Centrale	5	24.452,92
6	Pozzi	6	5.130,07
7	Candiani	3	2.405,03
8	Malattie Inf.ve	3	2.075,95
9	Oncologia	4	2.629,20
10	Ex Techint	2	307,34
11	Officine	3	910,96
12	CPS	1	488,46
13	Magazzino Farmacia	2	2.089,29
14	Asilo Nido	1	453,95
15	Bizzozzero	5	11.854,09
16	Centrale Termica	1	642,71
17	Obitorio	3	1.150
total		**98.945,64**	

Current numbers of the Busto Arsizio Hospital

The Candiani Building opened in 1926, this building was intended for Maternity and Paediatrics.

The Services Building built in the 1930s housed the hospital treasury. Today it houses the central kitchen in the basement, the staff training rooms and the nursing school, now a branch of the Insubria University.

The Bizzozzero Building finished in the early 1930s was built as a sanatorium for the treatment of tuberculosis. Currently the building houses the Internal Medicine Inpatients Ward of the Medicine and Rehabilitation Department, located on the 2nd and 3rd floors, which were renovated in 2009, as well as the Hospice, Psychiatry and the company canteen for employees.

The OGP Building is the first expansion of the original complex. The building houses the Gynaecology and Obstetrics Departments with delivery rooms, Neonatology and Paediatrics, Gynaecological Oncology and Haematology.

The Pozzi Building, built between the 1960s and 1970s, houses the departments of Immunohaematology, the

Transfusion Centre and Senology.
The Polysurgical Building, whose construction began in 1971, was opened in 1981. The building houses:

- the plate with high care intensity services such as the emergency room;
- the operating block including Haemodynamics;
- intensive care;
- the inpatient wards, the main ones being surgery, cardiology including Intensive Care, Orthopaedics and Urology;
- the analysis laboratory;
- sterilisation;
- radiology;
- the blood sampling centre.

Gallarate Hospital

P.O. GALLARATE			
n.	**Building**	**n. floors**	**Surface (SLP)**
1	Riabilitazione	3	4.320
2-3	Polichirurgico	6	17.150
4	Trotti Maino	5	8.930
5-6	Polimedico	6	13.430
7	Boito	2	4.800
8	Servizi	3	6.420
total		**50.730**	

Current numbers of the Gallarate Hospital

The Gallarate Hospital is located on a flat area of about 30,000 sq.m located in the centre of the city, right on the edge of the pedestrian centre. The area resembles an irregularly shaped quadrilateral, delimited by Via Pastori to the south where the main access is located, Via Bonomi to the north, Via Magenta to the east and Via Fogazzato to the west.
The state of current consistency of the building stock of the hospital available to the Valle Olona LHA is reported in table 1.1.2. The total area of almost 51,000 sq.m is divided between the various buildings.
The Boito Building opened in 1875. Currently, the spaces of the Boito Building house the offices of the Medical Department (with Protected Discharge Services, Medical Records and Hygiene Service), the Company Pharmacy, the Department of Psychiatry and the outpatient Otorhinolaryngology Clinics.
The Polysurgical Building was built around 1953. The expansion project for the construction of “plate for the emergency department to insert sterilisation activities, expand the emergency room (casualty department), coronary artery department and operating rooms dates back to the early 1980s. Currently the spaces house the inpatient departments of Cardiology, Traumatology and Surgery with their respective outpatient services. In addition to these there are the Emergency Room with Emergency Radiology, the Operating Rooms, the coronary ward with haemodynamics, CPR Unit and the Digestive Endoscopy Unit. Finally, there are some office spaces such as DAPSS and clinical engineering.
Building Services The construction of the original core began around 1930 and was then expanded in the 1960s, following renovations between the 1990s and 2008. Currently the spaces are occupied by services such as sampling centre, analysis laboratory, blood transfusion centre, kitchen and canteen, cloakroom, as well as technical maintenance services such as workshops and thermal power plant.
The Rehabilitation Building was built on the site of the old sanatorium. It reached its current conformation again in the 1960s with the construction of swimming pools and kinesitherapy spaces that were then adapted in 1997. Currently, the spaces are occupied by outpatient rehabilitation clinics, outpatient ophthalmology clinics and the Day Surgery Department.
The Polymedical Building was built in 1968 as a continuation of the Geriatrics Building. Currently the spaces are occupied by inpatient departments such as Neurology with Stroke Unit, Oncology and Medicine with related outpatient activities. Then there are the departments of Nuclear Medicine, Pathological Anatomy, Mortuary, outpatient clinics and minor dermatology surgery, dialysis, family consultation and child neuropsychiatry.
The Trotti Maino Building was built in the 1990s and renovations were completed in 2008. Currently the spaces of the Trotti Maino Building are occupied by inpatient departments such as Gynaecology and Medicine. Then there are the delivery rooms and gynaecological operating rooms, the nursery, radiology and outpatient senology clinics and the multiple sclerosis centre.
In 2002, work began on adapting and expanding the **reception** building to include switchboard activities and administrative admission of patients.
Information about the two hospitals is provided only for informative purposes. It is specified that reactivating operations of the two hospitals is not part of the subject of the tender.

Contextual and socio-economic framework of the intervention

This paragraph analyses the socio-economic structure of the administrative territories within the basin of influence of the project for the construction of a New Hospital, as well as the dynamics and trends in place, in order to interpret the needs of the population,

both from a current and future perspective.
The area of influence considered includes the municipalities of Busto Arsizio and Gallarate, and the entire Province of Varese, in order to make a comparison with the reference context. As for the state of affairs, a study of the socio-economic structure was carried out taking into account the ISTAT data collected as of 31 December 2020 in order to show a good relationship between the exhaustive data and their relevance. Instead, the diachronic comparison and analysis of dynamics and trends required the use of census data dating back to 2011 and 2019. Specifically, it was considered appropriate to close the diachronic analysis at 2019 since socio-economic trends would have been affected by anomalous data relating to the years of the COVID-SARS 19 pandemic emergency.
The analysis of data collected as of 31 December 2020 on the population structure has been summarised in the table. The table shows that the female population is always greater than that of men within all three territorial areas analysed.

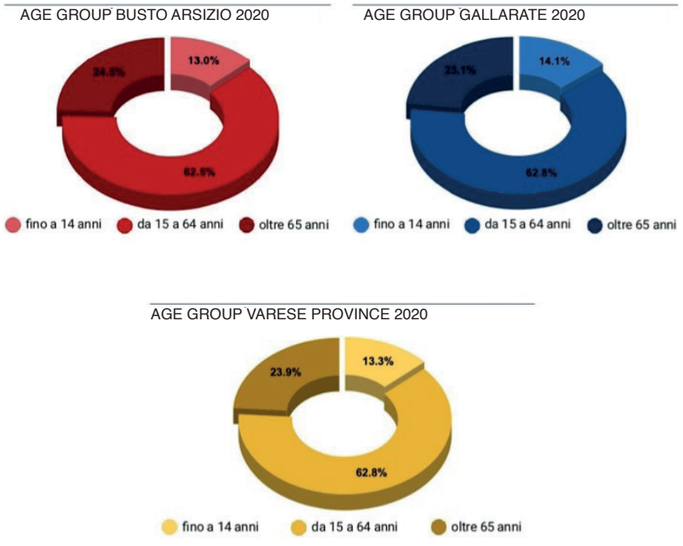
INDICATOR	BUSTO ARSIZIO	GALLARATE	VARESE PROVINCE
Popolazione residente	83045	52787	880093
Percentuale popolazione maschile	48.1	48.7	48.7
Percentuale popolazione femminile	51.9	51.3	51.3
Under 14	10895	7634	117412
15-64	52272	34059	555800
Over 65	20152	12514	211664
Incidenza popolazione sensibile	37.8	38.2	37.4
Indice di vecchiaia	188.3	163.9	180.3
Età media	46.4	45.3	46

ISTAT data as at 31 December 2020. (Italian Indicators)

Gallarate appears to be the municipality characterised by a younger settled population, with an average age of 45.3 years and a percentage of young people (under 14) equal to 14.1% of the total population, as well as an old age index significantly lower than that of the other two areas studied (163.9). Conversely, structural dependence (38.2%) is a negative factor since it is higher than that of the Municipality of Busto Arsizio (37.8%) and that of the entire Province of Varese (37.4%). Structural dependence strongly affects the economic sector because it represents the incidence of the sensitive population (the sum of the population under 14 and those over 65) on the economically active population capable of generating GDP. Similarly, structural dependence affects the need for social and healthcare facilities since it is an indication of the sensitivity of the population, which is also the one most subject to medical risks.
The Municipality of Busto Arsizio presents a much higher mean age (+1.1 year compared to Gallarate and +0.4 compared to the Province of Varese), as well as an old age index of 188.3. Assuming these data, it can be considered that the need for hospital and social care facilities in Busto Arsizio can be considered as equivalent to that of Gallarate.

Demographic characteristics of the reference population

A diachronic comparison of the change in the three age groups between 2011 and 2019 shows that the trends are precisely those of a continuous increase in the population aged over 14 years and, therefore, an increase in the old age index and mean age. The Municipality of Busto Arsizio is more subject to this general ageing than the Municipality of Gallarate, where, despite slight differences, the increase in resident population occurs for all three age groups considered. This increase does not occur for the Busto population under the age of 14, which, after eight years, remains essentially unchanged.
The increase in residents can be assessed in its entirety from the following line graph, which shows a steady average increase, except for the period characterised by the pandemic emergency that occurred from March 2020.
Specifically, both the municipalities of Busto Arsizio and Gallarate, and the Province of Varese see their resident population increase. The largest percentage change occurred in Gallarate (+7.7% for the period between 2011 and 2019 and +16.7% between 2001 and 2019). The increase in residents in Busto Arsizio (+5.4% between 2011 and 2019 and +10.3% between 2001 and 2019) is remarkable, although smaller, and certainly greater than that which took place in Varese (respectively +1.6% and +8.8%).



Age groups of the municipalities of Busto Arsizio and Gallarate, ISTAT, 2020.

However, it should be stressed that the population increase in each of the three administrative territories conflicts with an increasingly negative natural balance.
Indeed, in the eight years analysed, there has been a sharp decrease in births alongside an increase in deaths to a similar but opposite extent. The Municipality of Busto Arsizio recorded a 25.2% decrease in birth rates, slightly greater than that occurring within the

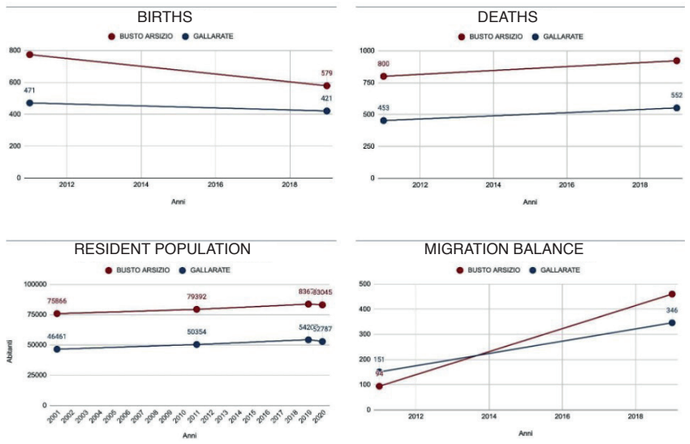
Province (22.8%). Gallarate, on the other hand, recorded a much smaller decrease in the figure, although it was also significant (10.6%). In contrast, deaths have increased by 15% - 22%, with higher values in the Municipality of Gallarate. The sum of these two factors caused the birth rate to fall and the mortality rate to rise in all three administrative territories, as well as a widespread decline in the natural balance, particularly visible in the Busto population, where a total loss of 343 subjects occurred in 2019.

A negative natural balance certainly does not explain the population increase that occurred in the eight years analysed. The answer comes from the migration balance. The two municipalities are proving to be increasingly attractive, unlike findings concerning the Province. In Busto Arsizio the migration balance increased by 389.4%, in other words almost four-fold. In the Municipality of Gallarate the increase is far lower, but the value is still more than two-fold (+129.1%).

The attractiveness of the two municipalities, mainly for work purposes, allows the population to grow, but at the same time involves an increase in the mean age and the old age index, as previously reported. Both these factors lead to an increase in the need for social and healthcare facilities.

The economic situation is, in fact, well defined by pie charts relating to the structure of the workforce. Busto Arsizio, the most attractive municipality, shows a percentage of employed subjects equal to 66.5%, higher than both the figure recorded in Gallarate (65.2%) and that relating to Varese (64.4%). However, as for the unemployment index, the Busto population is made up of only 6.9% subjects seeking work, a positive figure compared to Gallarate (7.2%) and the entire Province (7.3%).

Although the employment rate is higher in Busto Arsizio than in the other territorial areas analysed, per capita income is lower (22,984 euros compared to 23,242 euros for Gallarate and 24,101 euros for the Province). It is important to compare the average per capita income with the average cost per sq m of residential buildings. Varese shows a ratio between per capita income and residential real estate price



Population balance of the municipalities of Busto Arsizio and Gallarate, ISTAT, 2020.

per sq.m. (source: OMI Revenue Agency) of 17.1, significantly higher than those shown by Busto Arsizio (15.3) and Gallarate (14.9).

Going into the specifics of the social and healthcare sector, the impact on the economic structure of the Province of Varese is reported through statistical data taken in 2011. The sector provides employment for 2.8% of the total employees, distributed in 65,707 companies, or 6.3% of the total companies surveyed in the province.

Planned care provision

The following are some prospective data regarding the annual care offer expected for the New Hospital, obtained from the reassessment of the activity data of the two hospitals for 2018 in the light of the new hospital structure (beds) and the optimisation of occupancy rates.

With a view to integrating the care and treatment services currently offered by the two hospitals, there are plans to relaunch the treatment areas that already possess characteristics of excellence. The historic onco-haematological calling of Hospitals will be respected. They have always dealt with the treatment of both solid tumours and haematological diseases, malignant and not. The operating unit, in collaboration with the psycho-oncology service, will continue to use inspiring principles such as focus on the person and the doctor-patient therapeutic alliance, which distinguishes it from its institution. To complete a process that began in 2000 with the start of the programme for collection, manipulation and cryopreservation of Hematopoietic Stem Cells (CSE) from peripheral blood, in May 2015 the international accreditation JACIE (The Accreditation Committee ISCT-EBMT) was obtained for the execution of autologous haematopoietic stem cell transplantation for self-transplantation purposes, in collaboration with the Transfusion Medicine Unit.

In terms of neurological care, thanks to the experience acquired by the hospitals, especially with regard to specialist rehabilitation in Multiple Sclerosis and ischaemic cerebro-vascular diseases, it is expected both to maintain the diagnostic-therapeutic and rehabilitation excellence of the chronic patient, and to meet the demand for territorial urgency regarding clinical frameworks that require expertise, rapid decision-making processes in terms of differential diagnostics, diagnostic investigations and therapeutic choices.

Still in the emergency / urgency context, the new Emergency Department will be able to meet the needs of the catchment area that

Description	N of services
Ordinary inpatient	31.700
Births	2.500
Emergency accesses (triage)	106.000
Emergency room services (excluding laboratory tests)	255.000 (of which 76,000 radiological exams)
Surgical interventions (inpatient care)	7.000
Surgical interventions (daysurgery and outpatients)	7.500

Care offer planned for the Great Malpensa Hospital.

will lead it to represent one of the largest admission facilities in the Lombardy Region and to be a reference centre with multidisciplinary services. In addition to the ordinary inpatient section, the cardiology area will have an area dedicated to urgencies and intensive diagnostic and interventional care for haemodynamics and electrophysiology. These will be provided at the hybrid angiographic rooms within the operating block. The excellent services guaranteed by the various surgical specialties will be equally important, increasingly focused on a less invasive modern approach.

In light of the above plan, the following is a list of the current departments of the Valle Olona LHA for each of which a possible development is theorised within the New Hospital:

- Emergency and Admission Department
- Cardio-Nephro-Vascular Department
- Medical Sciences Department
- Maternal and Infant Health Department
- Diagnostic Services Department
- Oncology Department
- Neuro-Rehabilitation Sciences Department
- Mental Health and Addiction Department
- Hospice

The preferred functional model will be structured by homogeneous functional areas, namely:

- Surgical Area
- Neuro-Rehabilitation Area
- Medical Area
- Critical Area
- Maternal and Infant Health Area

The planned services and activities include:

- Emergency and Admissions Department (DEA)
- Inpatient Resuscitation
- Nuclear Medicine
- Operating Block
- Birth Centre
- Paediatric First Aid
- Obstetrics First Aid
- Psychiatry (SPDC)
- Coronary Care Unit
- Haemodynamics
- Electrophysiology
- Hospital Polyclinic
- Pathological Anatomy
- Laboratory Medicine
- Microbiology - Virology
- Radiology
- Neuroradiology
- Digestive Endoscopy
- Transfusion Unit
- Medical Administrations and Medical and Social Healthcare Professions Management (DAPSS)
- Sterilisation
- Pharmacy
- Morgue

The volumes of activities planned for the New Hospital are configured within the following numerical drivers:

- 31,700 total hospitalisations
- 2,500 child births (today: 1,500)
- 106,000 accesses to the First Aid Unit (today: 80,000)
- 7,500 Ordinary Inpatient interventions
- 7,500 Day Surgery (DS)/ Outpatient interventions

The Great Malpensa Hospital will have a maximum availability of 773 beds of which:

- 575 ordinary beds
- 97 Day Hospital/Surgery
- 36 Intensive Care
- 40 beds for Dialysis
- 25 cots

Desirable occupancy rates are 90% for Medical Area inpatients and 85% for Surgical Area inpatients.

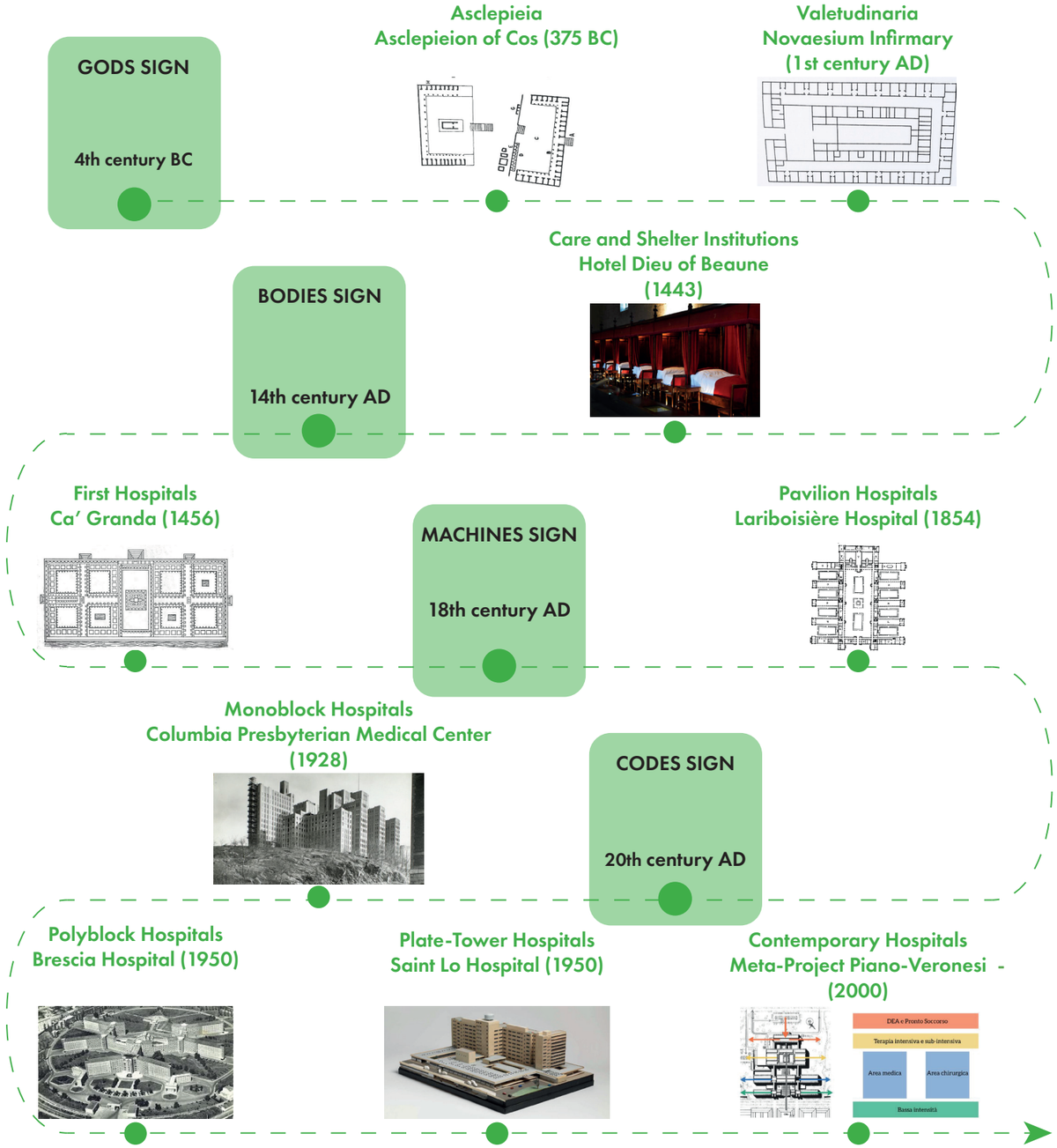
1.3
Evolutionary trends in hospital construction

Re-thinking the Health Architecture project

The Architecture project has always been an opportunity to translate into spatial physicality the multiple challenges posed by contemporary society. In particular, Health Architectures are the place where the most disruptive social, economic and environmental global trends must find a dedicated spatial, functional and technological synthesis.
The hospital is an architectural typology that can be said to have always existed, and which has gone through historical periods transforming itself, even radically, but defining a clear evolutionary succession. Indeed, the hospital is the type of building that more than any other acquires the characteristics of a "social" architecture or that accepts and translates into architecture (spatial physicality) a series of political, economic, social, organisational, epidemiological, environmental, ecological, functional and relational requests. Hence it turns out to be an architecture that allows you to reread the history of its morpho-typological transformation in the light of the evolution of society, medicine and technology, and to outline future development trends.
From the close link with nature and the link with the otherworldly life of the first hospitals, through the differentiation between healthy and sick bodies of medieval hospitals, to the mechanisation of the hospital to treat a different part of the body in each building, hospital architecture provides evidence of a clear cultural and social approach to care, strongly mediated by the technological advancement of the period. This is how, for example, the possibility of vertical expansion and increasing complexity of the hospital engineering systems contributes to establishing what we now know as the "single block" type, and which make up the majority of the existing hospital stock in Europe. These rigid and extremely functional models, thanks to technological progress, research on the genetic code and personalised medicine, gradually open up to contamination and hybridisation towards hospital systems with a more horizontal development or, in any case,

integrated with the context. This is also achieved through consolidation of renowned design experiences of Masters of Architecture - from Le Corbusier to Alvar Aalto - and, more recently, with the Renzo Piano's metaproject.
Hence, today we need to re-think the hospital project with operational strategies for the hospital of the future that carefully interpret the global transformations of population aging, social inclusion, digitisation and artificial intelligence, climate change and sustainability, considered form a holistic perspective.
Among the many healthcare facilities, the Acute Care Hospital is, therefore, the most complex for its morphological, spatial and functional organisation, influenced by the presence of different users with multiple needs. The hospital is, in practice, a "city in the city" where multiple functions find space and relationships in a single complex infrastructure. Hence the need to note its state of health, underscoring how the widespread technological components, the lack of significant investments and the great management complexity of the hospital have contributed to slowing down research on the architectural, morpho-typological and construction aspects of these infrastructures. In particular, it is estimated that, compared to an optimal life cycle of about 50 years, 70% of European hospitals are obsolete, and 50% are not adequate to accommodate present day organisational models. This rate of obsolescence stems from the inability of an excessively rigid structure to accompany the sudden changes and modifications required by the evolution of processes and technologies. Moreover, considering the extensive time required to design and build such a complex infrastructure (an average of 10-20 years is estimated in Europe), the risk of "opening an already old hospital" is very high.
New metaproject models and frameworks are, therefore, needed to help identify the correct sizing, functional and spatial relationships, and performance requirements that a forward-looking hospital must meet.

Finally, it is necessary to measure the qualities of a hospital and identify Performance Monitoring Indicators (KPIs) for each theme area that can convey contemporary hospitals towards true new generation models (Next Generation Hospitals), which are functional, sustainable, digital, safe, inclusive and networked with the territory to effectively intercept the health needs of the future.



Edilizia Ospedaliera, Capolongo 2006

2

Vision and Goals

The chapter summarises the vision of Valle Olona LHA for a new model of hospital capable of meeting social needs with cutting-edge services in an efficient and, at the same time, flexible and future-oriented infrastructure. The quality of hospitality and openness to the needs of the territory are an intrinsic part of the mission of the Great Malpensa Hospital: safe, adaptable and sustainable.

The Valle Olona LHA is committed to providing specialised healthcare services for diagnosis, treatment and rehabilitation, based on the principles of **Equality, Impartiality, Continuity, Participation, Efficiency and Effectiveness** The company's mission is to respond to citizens' health needs with appropriate, integrated and high quality care pathways. The construction of the New Hospital will meet the need to overcome the structural limits of the current **Busto Arsizio and Gallarate Hospitals**, characterised by buildings no longer adapted to current needs and incompatible with the most advanced organisational models being implemented.

The New Hospital will be a landmark for acute care of medium and high complexity, with rapid diagnostic paths and a modern architectural layout that favours integration with the territory, capable of facing ordinary challenges, and the specific traits of both the context and territorial proximity. In particular, the **proximity to Milan Malpensa** Airport gives the intervention a national and international scope, while the territorial continuity with the new Regional Emergency Hub that will be built in Gallarate allows the hospital to provide support to the strategic centre for the management of health crises by integrating **advanced features** and responding to the **emergency** and training needs of the region.

The pandemic experience has reinforced the importance of designing flexible and safe spaces for infection control, promoting multidisciplinary approaches and innovative processes that can respond to changing health scenarios.

The **guiding criteria** to be adopted in reengineering processes, which require the construction of a new hospital structure include:

- **Differentiating inpatients** by type of diagnosis and treatment;
- **Separating paths** into elective and emergency/ urgent processes;
- **Separating paths and spaces** between daycare activities (outpatient and day hospital) and continuous cycle activities;
- **Beds that are functional** to the epidemiological framework of the reference basin;
- **Centralisation** and versatility of general support services/spaces;
- **Monitoring** continuity of care

The main goal the LHA wants to achieve is to transfer the hospital activities of the Busto Arsizio and Gallarate Hospitals to a single hospital facility according to criteria of compacting and rationalising the logistics.

The establishment of a single facility will provide a reference centre capable of meeting a medium/high complexity healthcare demand. The project is complementary to the reorganisation of the offer in the territory with particular reference to the areas of intermediate care as a synergistic support to the activity of the New Hospital.

The strategic planning lines of the Company include as specific objectives:

- Identify the **patient** as the centre of every interest and decision;
- Strengthen the **depart-mental organisation**;
- Enhance **human resources**;
- Invest in **technological innovation**;
- Specialise **the services** provided;
- Increase **interactions** with the institutional, health and social components of the territory, with local voluntary organisations and with organisations that defend citizens' rights.

The New Hospital, called the Great Malpensa Hospital, aims to achieve high quality hospitality by adopting principles of flexibility in the distribution of functions, organised by homogeneous functional areas.

The hospital will be configured as a **complex high-tech infrastructure** connected to and open to the urban and territorial context, and to the health needs of the territory, strongly integrating the social and health services of the district.

The hospital, in line with the main international trends, will have to be **safe, adaptable and transformable** in its infrastructural, technological and organisational configuration in order to intercept the major social, epidemiological and demographic changes.

The modular and flexible hospital, organised as much as possible by standardised modules, will have a strong propensity for daycare thanks to the presence of an important daycare centre system. In light of global and local challenges, the goal is to create a **green and sustainable hospital**, with a strong propensity to digitisation and focused on the comfort of all users, patients and healthcare professionals.

The Great Malpensa Hospital aims to be the prototype of the **Hospital of the Future**, a laboratory of experimentation and innovation, subject to continuous monitoring and improvement of its social, environmental and organisational qualities.

Kansai International Airport, Osaka (Japan) - 1994

3

Technical, Spatial and Functional Requirements

The chapter defines the main functional and design requirements the intervention must meet. Specifications relating to the dimensioning of the functional areas, their equipment as well as the main design ideas supported by best practices and international scientific literature are described in detail.

3.1 Functional Plan

Introduction

The **size of the New Hospital** was defined on the basis of regional planning and by involving the Valle Olona LHA's strategic management and clinicians. In accordance with the model identified, a detailed analysis was carried out for each hospitalisation activity, aimed at assessing current levels of productivity, identifying the possibilities of restoring efficiency and improving performance. This analysis has also allowed to define the **necessary equipment for each service**, in compliance with the principles of resource optimisation, while ensuring full compliance with the prescriptive standards established by current regulations. The endowments defined in the document aim to improve the supply and increase the medical activity provided compared to the current volumes of the two hospitals. The New Hospital provides a total of **773 beds, of which 575 ordinary beds, 36 intensive care beds, 97 beds for Day Surgery and Day Hospital activities (BIC and MAC), 40 technical dialysis beds and 25 cots.**

Methodology

The methodology proposed for the organisation into macro areas, taken up by the Meta project Piano-Veronesi (Targeted Research Project - Technical, Organisational

and Management Guiding Principles for the Construction of High Tech Hospitals and Care, and regulated by Ministerial Decree 12/12/2000), provides for the division of the hospital into distinct macro areas, each with a specific functional identity, but closely integrated with the others to ensure continuous care paths by defining spatial and functional matrices.
The main constituent elements were identified and defined for each hospital macro area, with particular attention to **the overall size**, the **functional and spatial relationships** between the various areas, and the main equipment provided. This approach has allowed to outline an integrated and consistent configuration to ensure operational efficiency, safety and compliance with regulatory standards, while responding to the specific needs of each hospital function. The proposed values for pre-sizing homogeneous functional macro areas are not intended as prescriptive values, but as references for designers.

Reading Guide

Structure and Contents

The description of Areas within this document has been divided as described below:

1. **Description and general requirements:**
- Title;
- Reference case study;
- Description of the general requirements of the Areas, with the list of Functional Units present.

2. **Functional reports and dimensional benchmarks with other national and international case studies:**
- Radar to identify proximity relationships between Areas;
- Dimensional graphs comparing with other Case Studies;
- Total dimensioning of the Area

3. **Environmental Units:**
- Description of the individual Environmental Units present in the Area;
- Any quantitative recommendations to be anticipated within the Environmental Unit (e.g., number of beds, workstations or clinics).

In order to guarantee the innovative character of the New Great Malpensa Hospital, from a functional, typological and design point of view, a sample of European hospitals built in the last 10 years was considered as a benchmark. Acute Care Hospitals were selected, in a benchmark between 400 and 800 beds, with healthcare activities and intensity of care comparable to the new project in place, to determine the sizing of hospital macro areas.
In order to bring the new design further into the national context of reference, recent projects of the Italian landscape were also taken into account to define synthesis indicators.

Reading Guide

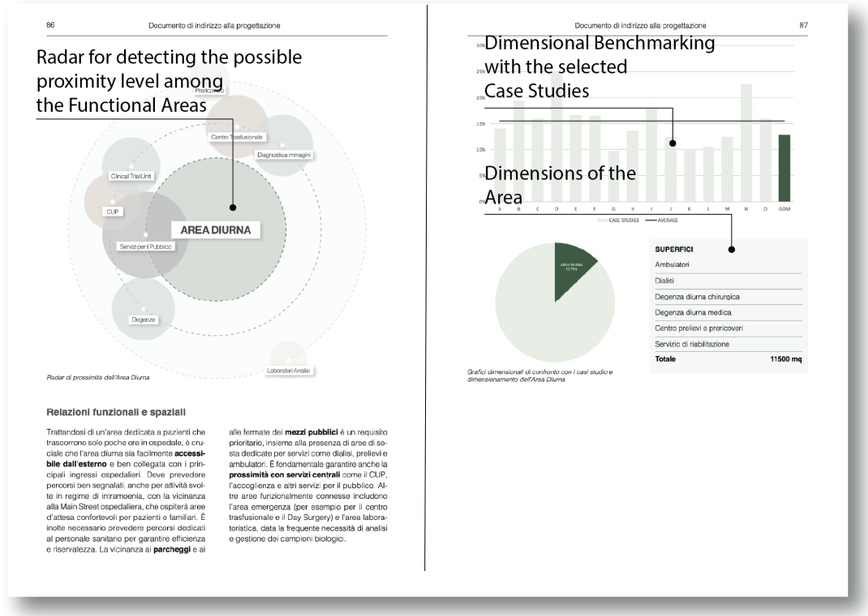
To facilitate interpreting the various macro areas, the following is a summary diagram with the information provided in each tab

INFO

The design references in the document should be considered only as a thematic and informative cue for designers: the judging committee's evaluations will not prefer a formal affinity to the aforementioned references.

SPACING & FUNCTIONAL RELATIONS

BENCHMARK



SPATIAL UNITS

The total surfaces reported include the share part of general connective, internal connective and surfaces for façades parameterised to the gross surface of each Macro Area.

	sq.m	%
EMERGENCY AREA	2750	3%
SURGERY AND CRITICAL CARE AREA	11900	13.2%
OUTPATIENT AREA	11500	12.8%
INPATIENT AREA	28700	31.9%
DIAGNOSTIC AND THERAPY AREA	7000	7.8%
LABORATORY AREA	2200	2.5%
GENERAL SERVICES AREA	12800	14.2%
LOGISTIC SERVICES AREA	6600	7.3%
TECHNICAL ROOMS	6550	7.3%
TOTAL	**90000**	**100%**

Dimensional model hypothesis of the New Hospital's Functional Areas

The table defines a hypothesis model of the size of the New Hospital, based on the healthcare planning provided at regional level and the wishes expressed by the strategic management of the Hospital. The indicated values are not to be considered as prescriptive, but as a dimensional reference for the design of the new structure. During the feasibility design phase, the contractor will be asked to define a dimensional model based on the design defined in a subsequent phase of dialogue with the Contracting Authority.

The total surface area parameter of the "building box" (including technical rooms and technological hub), / number of Ordinary Beds + DH + ICU must be placed, on the basis of recent trends, at a value of not less than 140 sq.m/bed, and only for Ordinary Beds it must be placed at a value of not less than 175 sq.m/bed, in line with the benchmarks of reference.

The general sizes defined in the DOCFAP are given below.

Dimensions of the DOCFAP design hypothesis

SLP New Hospital	**110,000.00 sq.m**
Hospital Surface Areas	**90,000.00 sq.m**
Central Technological Surface Area	**20,000.00 sq.m**
Land surface area	**167,240.00 sq.m**
Indoor hospital surface area - maximum	**30,000.00 sq.m**
Deep green surface area	**59,280.00 sq.m**
Hanging green surface area	**25,000.00 sq.m**
Total parking surface area	**45,000.00 sq.m**
Employee parking surface area	**20,000.00 sq.m**
Public parking surface area	**59,280.00 sq.m**
Surface areas of other car parks	**5,000.00 sq.m**
Total parking spaces	**1502**
Employee parking spaces	667
Public parking spaces	667
First aid parking spaces - users	38
Parking spaces for frail users	130

Dimensions of the DOCFAP design hypothesis

Emergency Area

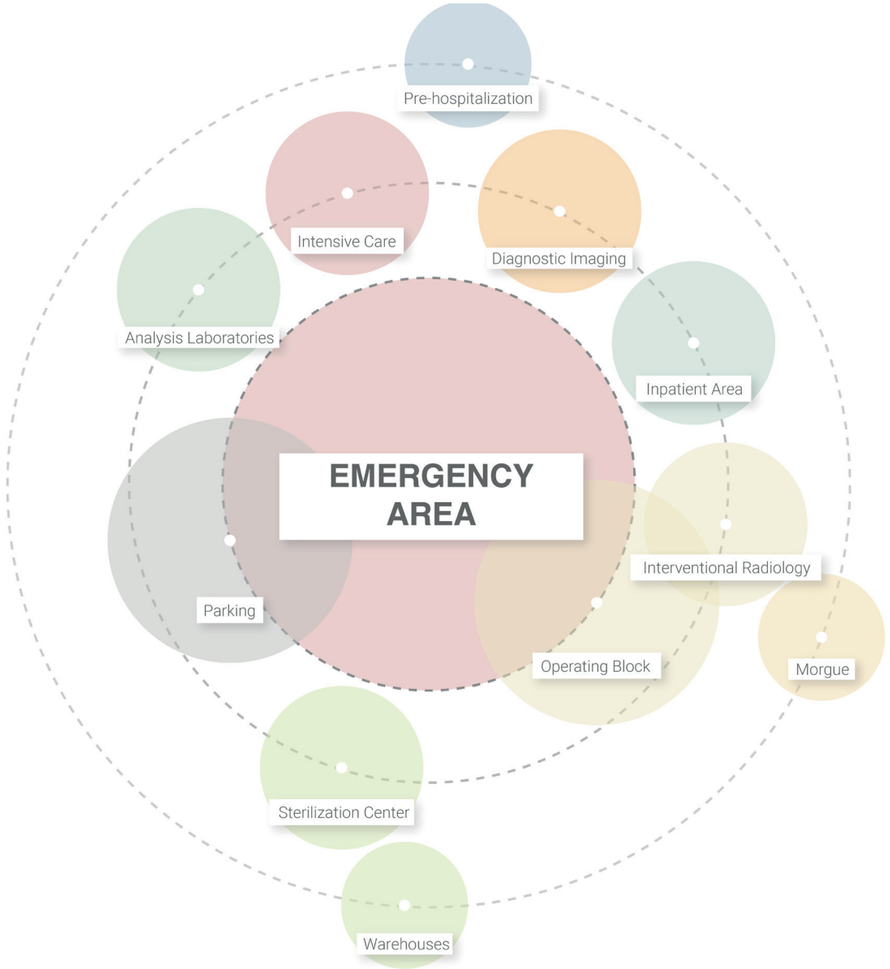
EMERGENCY AREA

- Access area
- Triage area
- High Patient Traffic area
- Paediatrics and Obstetrics Fast-Track
- Psychiatry Fast-Track
- Intensive Short Observation Area (OBI)
- Buffer area
- Low and medium intensity
- Diagnostic area
- Healthcare Supports
- Technological equipment

General Requirements

The Emergency area of the hospital is dedicated to the management and access of the critical patient. It is one of the core areas of the entire sector. The main activity is First Aid. Within the same functional macro area, it is also possible to identify dedicated diagnostic and interventional activities, as well as the relative paths for patients according to different levels of urgency or intensity.
The location of this area within the hospital building is crucial and of high importance. Indeed, the emergency-urgency area must be equipped with its own road network and dedicated access with autonomous parking, regardless of other entrances and the connection with the helipad, to be provided within the intervention area, avoiding the location at heights, as far as possible.

BOE Hefei Digital Hospital, China



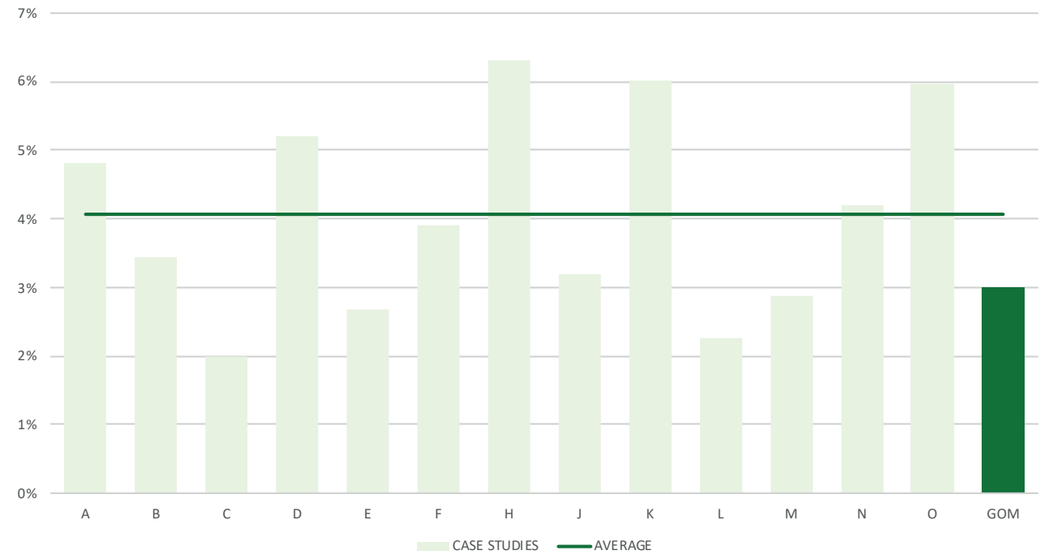
Emergency Area Proximity Radar

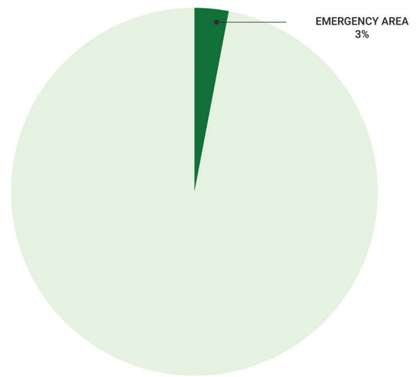
Functional and spatial relationships

The emergency and urgency area, including the emergency room, is designed to ensure rapid access to care, thanks to tight functional and spatial integration with other hospital macro areas. It is strategically equipped with separate accesses for ambulances, autonomous patients and any infectious patients, as well as dedicated routes to avoid interference with other hospital activities. The emergency area is directly linked to ICUs, operating block and diagnostic services, enabling rapid transfer of critically ill patients to the most appropriate areas for treatment, such as coronary ICU, Stroke Units or operating theatres for surgical emergencies. Proximity to the diagnostic area ensures priority access to imaging and analysis tools, which are critical to the timely management of critical cases. In addition, the area is equipped with functional connections to inpatients and short observation units for smooth management of stabilised or discharged patients.

The emergency urgency area needs:

- Helipad for the transport of critical patients to be inserted in the project area;





Dimensional graphs comparing with case studies and sizing of the Emergency Area with respect to the total area of the Hospital

sq.m

ENVIRONMENTAL UNITS	
Access area	
Triage area	
High Patient Traffic area	
Paediatrics and Obstetrics Fast-Track	
Psychiatry Fast-Track	
Intensive Short Observation Area (OBI)	
Buffer area	
Low and medium intensity area	
Diagnostic area	
Healthcare Supports	
Technological equipment	
Total	**2750**

- Access area with a large waiting room where admissions take place;
- Triage area;
- Pre-triage and post-triage buffer space that are useful in case of emergencies and overcrowding. They are obtained by implementing a transformation of the intended use of some spaces into emergency areas;
- Low intensity area, characterised by medical and nursing clinics, from which, once the service is finished, the patient is discharged;
- High/medium intensity area, characterised by shock rooms and boxes, equipped with technical beds for stabilisation and emergency/urgency interventions;
- Area of diagnostic imaging, in common between the area of low and medium/high intensity, consists of an internal waiting room for walking and stretchered patients, and the ultrasound, X-ray and CT diagnostic rooms (necessary for trauma centre functions), and also the Plaster Room;
- Intensive Short Observation Area (OBI);
- Departmental area of emergency medicine equipped with support and work spaces for doctors and nurses.

Surgery and critical care area

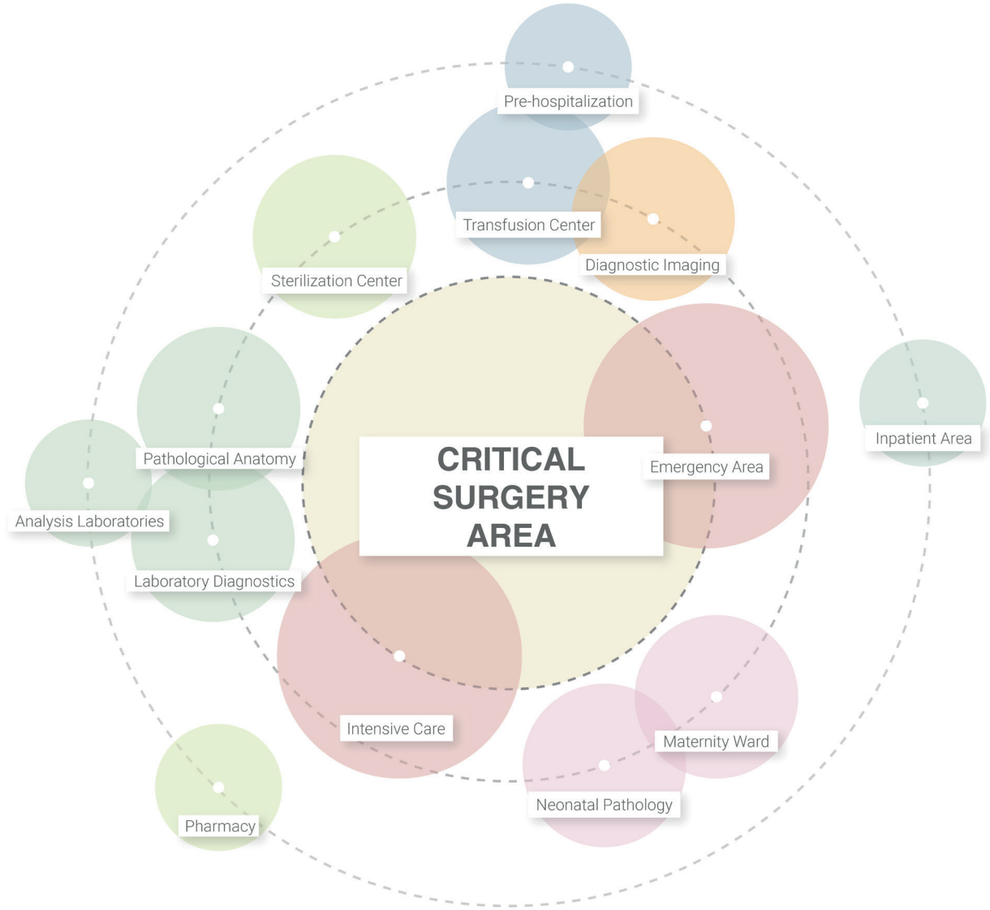
SURGERY AND CRITICAL CARE AREA

- Multifunctional Operating Block
- Interventional Radiology
- Endoscopy
- Intensive Care
- Birth Centre
- Buffer Space

General Requirements

The Surgery and Critical Care Area is a highly specialised section designed to ensure close integration between its main functional components, precisely operating block, interventional radiology, endoscopy, intensive care and the point of birth. The functional and spatial relationships between these units are designed to optimise patient, material and staff flows, ensuring operational efficiency, safety and rapid intervention.

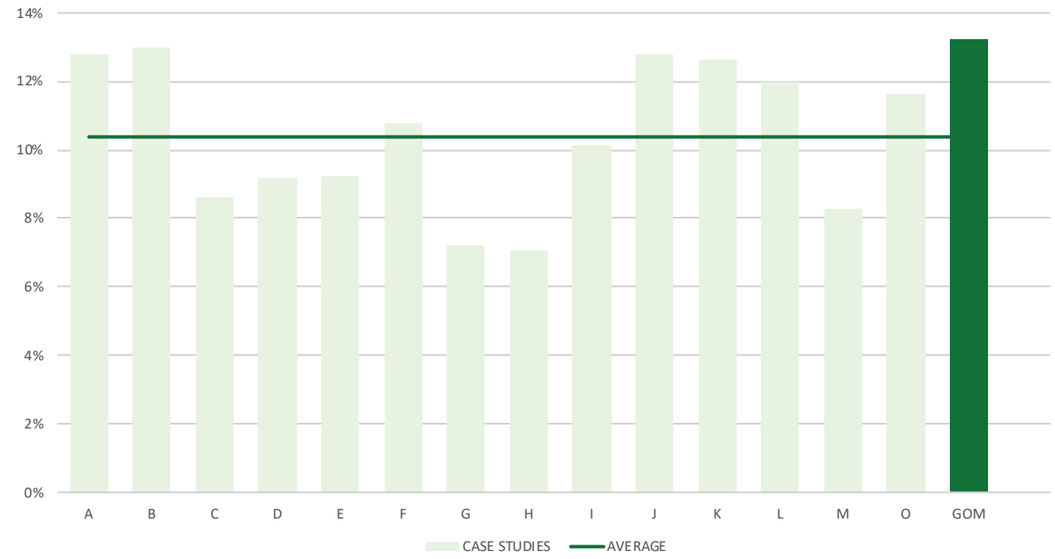
Stavros Niarchos Fundation, Greece, (2018)

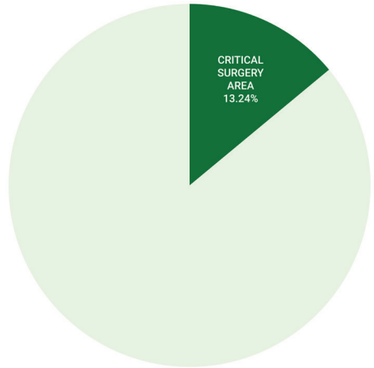


Proximity radar of the Critical-Interventional Area

Functional and spatial relationships

The area must be located close to complementary departments, such as emergency rooms, radiology and emergency diagnostics, to allow quick access and smooth management of patients from critical areas and high technological complexity. In the proposed functional model, particular attention must be paid to defining the degree of contiguity between related functions, even if autonomous.





Dimensional graphs of comparison with case studies and defining the size of the Critical-Interventional Area

SURFACE	sq.m
Multifunctional Operating Block	
Interventional Radiology	
Endoscopy	
Intensive Care	
Birth Centre	
Total	**11900**

MULTIFUNCTIONAL OPERATING BLOCK

The multifunctional operating block is the main function of the area, and must be configured in terms of size with a surface area equal to about 30% of the area. It is defined as an architectural-plant engineering complex with a "low microbial load", distinct and contiguous to other *core* hospital activities and essential for carrying out surgery.

On the basis of the requirements expressed in the demanding framework relating to the organisational structure envisaged, it is necessary to provide **16 operating rooms**, divided into **four functional modules**:

- Scheduled activity: 2 modules of 4 operating rooms
- Mixed activity: 1 module of 4 rooms for planned activities (high-tech) and emergency
- Daytime activities: 1 module of 4 operating rooms

2 hybrid operating rooms with high technology, including 16 operating rooms in total, should be designed to integrate diagnostic and therapeutic equipment.
It must be equipped with all the **support services** and ancillary equipment required for surgical procedures and the efficiency of the organisational model, such as:

- Preparation and recovery rooms
- Preparation rooms for medical staff
- Physician support areas
- Relaxation areas
- Laboratory for collection and dispatch of biological samples
- Reporting room

Service supports common to the whole block such as:

- Single and multiple isolated cubicles for mixed mode resuscitation areas
- dirt collection with drainer and pan washer
- patient entry
- bed/stretcher storage
- bed reconditioning room
- operating table disinfection
- storage of clean operating tables
- cylinder storage
- materials decontamination room
- instrument storage (for sending to sterilisation)
- admission input control
- paediatric relative entrance filter/changing room
- staff entrance filter/changing rooms
- staff toilets
- meeting room
- staff relaxation area with toilets
- central sterile storage - arrival of disposables
- doctor/relative interview rooms
- waiting room for relatives with toilets
- cleaning room area

Stavros Niarchos Fundation, Greece, RPBW (2018)

RADIOLOGY INTERVENTIONAL AREA

Interventional Radiology includes **3 rooms equipped with angiograph and 1 angiology MRI room.**
Interventional radiology must be placed outside any extraneous interference, and must be contiguous with the ICU, the Emergency Department, the sterilisation centre and day surgery (surgical area). The patient has filter access and is taken to the area in front of the radiology rooms where two separate zones are to be provided for the preparation and awakening of patients. Also for interventional radiology, as for the operating block, it is necessary to ensure an effective connection with other areas of the hospital that need continuity/ proximity relations, while maintaining the correct independence and sterility.
It is necessary to ensure the presence of support areas and services for the operation of radiological activity, such as preparation and resuscitation rooms, staff rooms, healthcare supports, work areas, service supports and technical rooms for technological equipment, adequately sized on the basis of the expected activity flows and of dedicated staff flows.
At plant level, the splitting of the mechanical system must be such as to reduce the downtime to the bare minimum (either for maintenance, renovations or breakdowns), so as not to interfere with the operation of healthcare activities. All preparation and resuscitation stations will have to be set up for monitoring and environmental visualisation of the patient.

Mater Hospital, Olbia (Italy)

BUFFER SPACE

It is necessary to define within the intervention area and the intensive care unit a buffer space that can be activated in case of emergencies and overcrowding.

ENDOSCOPY

The endoscopy unit will be organised by centralising the operating units with 5 diagnostic endoscopy rooms and 3 interventional endoscopy rooms. Dual access should be provided, one for staff and one for inpatients (ordinary residents, day residents and patients from other hospital facilities and possible emergencies).
In addition to the clinical service rooms, healthcare supports,

Number of rooms	**Minimum**
3 interventional endoscopy rooms	**Surface Area**
5 diagnostic endoscopy rooms	40 sq.m

rest areas, areas for administrative activities and service supports for logistics must also be provided.
For endoscopic procedures that require the combined use of ionising radiation, it will be necessary to provide adequately shielded diagnostic and interventional rooms. Moreover, the use of diode lasers for therapeutic applications must be provided in the rooms, with the related safety systems
In terms of plant engineering, the splitting of the mechanical system must be such as to reduce the downtime to the bare minimum (either for maintenance, renovations or breakdowns), so as not to interfere with the operation of healthcare activities.

Connections
The endoscopy service should be a priority for the following hospital and functional areas: Day Area, Intensive and Sub-Intensive Care Area, Blood Transfusion Centre, Pathological Anatomy, as well as the functional connection with the pathological anatomy service.

INTENSIVE CARE

Intensive care units occupy a structurally defined area with qualified staff and equipment suitable for monitoring, treating and supporting vital functions, 24 hours a day, of patients in critical condition. In the functional program, it is preferable to provide an intensive care area divided into 4 modules of 8/10 pl each. In particular:

Intensive Care	**36**
Anaesthesia and resuscitation	8
Post-operative Intensive Care	8
Stroke Unit	10
Coronary Unit	10

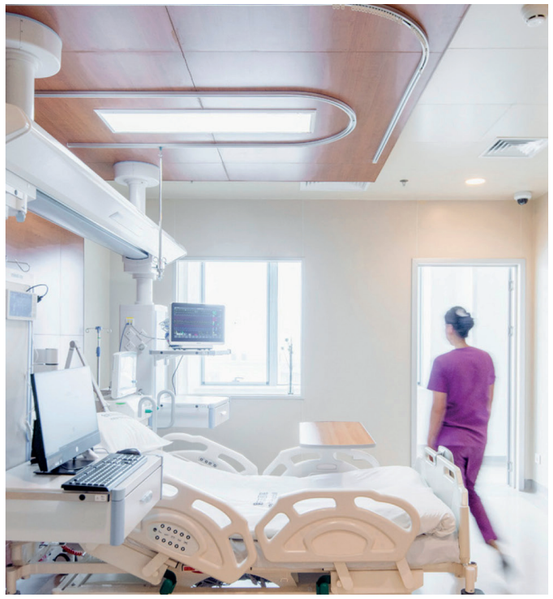
For each module it is necessary to provide
- health supports that group together all functions of personal nursing and medical work, control areas and ward housekeeper.
- service supports concentrating part of the service spaces such as equipment depots, clean material, laundry and dirty material collection. In common among the intensive care modules are common supports such as waiting rooms, filters and interview areas, work areas, rest areas for medical staff.

Connections
Clean and sterile material must be replenished through a dedicated transport system, physically separate from the one dedicated to dirty material. Transport systems (dirty and clean material) will be directly connected to the centralised sterilisation service, if this is not placed adjacent to it. Intensive care units have an easy connection with operating blocks, interventional radiology as well as diagnostic services. In intensive care, there are basically three separate types of access, all three of which have a filter: one for patients, one for staff and goods, and an additional access for relatives. Intensive care can be positioned in priority relationship with the following hospital and functional areas:
- Operating Block;
- Interventional Radiology;
- Diagnostic and therapy area;
- Endoscopy Unit;
- Transfusion Centre;
- Pathological Anatomy;
- Semi-Intensive Inpatient Area

BIRTH CENTRE

The birth centre is the area of the hospital dedicated to the management of the childbirth process and the stages of labour, childbirth and postpartum, with the aim of ensuring high standards of comfort and safety for mothers, infants and families.
We suggest the structuring of the area with **5 delivery rooms**, one for special procedures, and 1 room dedicated to caesarean sections, one for scheduled activity and one dedicated to emergencies; these two sectors are to be provided in contiguous spaces to optimise work management, related services, logistics and plant engineering conduits. Two neonatal islands may also be envisaged.

Organisation and characteristics of the functional area
The Maternity Ward shall be equipped with healthcare support areas, service supports and common services.
The operating room must have an adequate size for Caesarean sections (min 40 sq.m), and must have the necessary characteristics to accommodate any intraoperative diagnostic and radiological interventional technologies. It must also possess the characteristics of sufficient flexibility to allow the use of technologies currently used outside the strictly surgical environment.
The prenatal activity rooms (prenatal monitoring room, examination room and observation room) must be integrated as areas of social and healthcare support.



BOE Hefei Digital Hospital, China (2019)

Connections and routes
It is suggested to provide a direct and dedicated link between the emergency area, the obstetrics operating block, the birth centre and the neonatal intensive care unit.
The Maternity Ward should be a priority for the following hospital and functional areas:
- Intensive and Sub-Intensive Care Area (TIN)
- Radiodiagnostic Support (CT/MRI)
- Inpatient Area

Outpatient Area

OUTPATIENT AREA

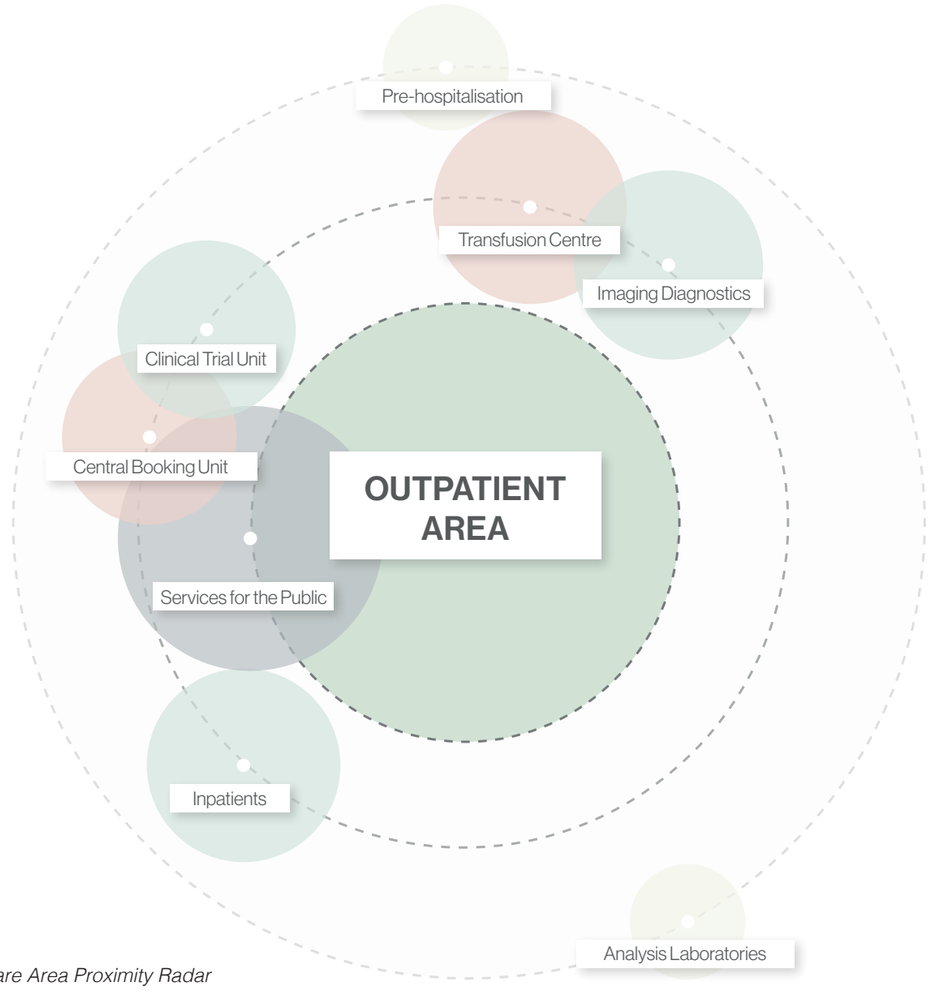
- Outpatient Clinics
- Dialysis
- Daycare for surgical
- Daycare for medical inpatients
- Blood collection and pre-admission centre
- Rehabilitation Unit

In a hospital setting, the outpatient area is a strategic unit for the care and delivery of multi-professional and multi-specialist diagnostic, therapeutic and rehabilitation services that do not involve ordinary hospitalisation, which is estimated to grow in the near future. The main activities include outpatient services and outpatient treatments, such as Day Hospital and Day Surgery, where less complex surgeries, therapies and procedures that do not require overnight stay are performed. The expansion of this area in recent hospital projects is in line with current trends in healthcare in terms of care, contributing to the reduction of healthcare costs related to prolonged hospitalisation periods.

General Requirements

The general principle that guides the design of the area is to separate the outpatient and outpatient area, and make it autonomous from ordinary inpatients.
The dedicated area must be centralised (Day Centre) to the 1st and 2nd level Clinics and Outpatient Activities (Day Hospital, Day Surgery). The solution that sees the concentration of these activities requires the creation of a centralised and efficient reception area.

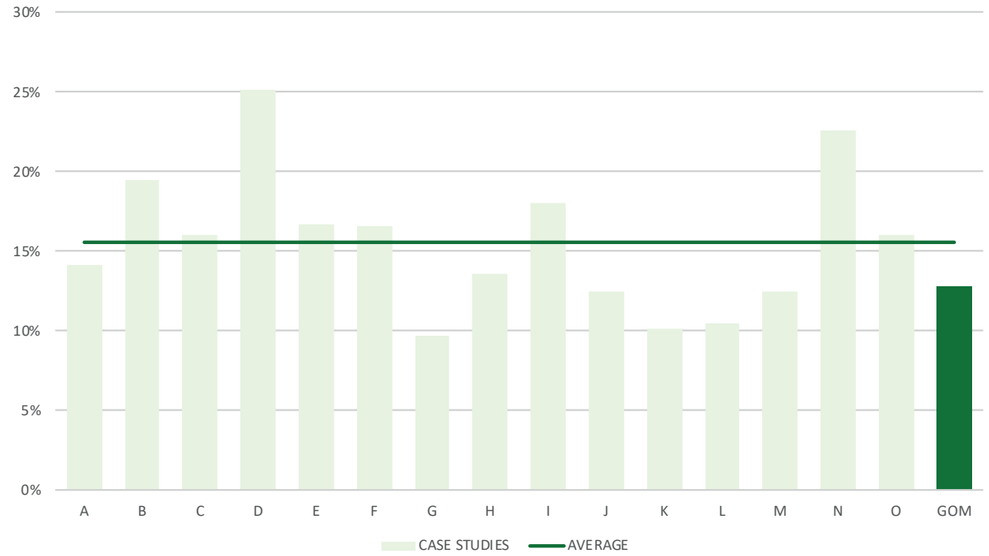
Cantonal Hospital Uri Altdorf, Switzerland

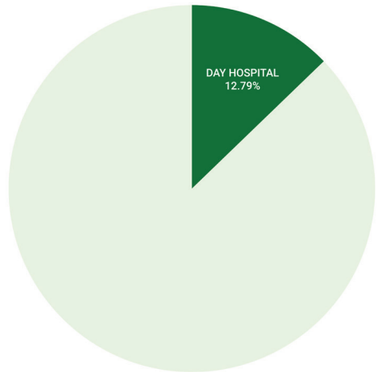


Daycare Area Proximity Radar

Functional and spatial relationships

As this is an area dedicated to patients who spend only a few hours in hospital, it is crucial for the outpatient area to be easily **accessible from outside** and well connected to the main hospital entrances. It must provide well marked routes, even for activities carried out within the hospital, with proximity to the hospital Main Street, which will accommodate comfortable waiting areas for both patients and relatives. It is also necessary to provide dedicated pathways for healthcare staff to ensure efficiency and confidentiality. Proximity to **car parks** and **public transport** stations is a priority, along with dedicated rest areas for units such as dialysis, blood sampling and clinics. It is also essential to ensure **proximity to central units** such as the central booking unit (CUP), reception and other services for the public. Other functionally connected areas include the emergency area (e.g., for the blood transfusion centre and Day Surgery) and the laboratory area, given the frequent need for analysis and management of biolog-





Dimensional graphs of comparison with case studies and dimensioning of the Outpatient Area

SURFACE

Ambulatory care	
Dialysis	
Daycare for surgical Inpatients	
Daycare for medical inpatients	
Blood collection and pre-admission centre	
Rehabilitation Unit	
Total	**11,500 sq.m**

CLINICS

Outpatient activities are aimed at providing specialised services (diagnostic and therapeutic), even complex, related to the various medical and surgical disciplines, which do not require hospitalisation of the patient. Facilitated connection to diagnostic areas is also required, differentiating the pathways between daycare patients and inpatients. Access must also be provided for inpatients who have to undergo examinations or specialist examinations (connected with the diagnostic equipment that requires moving the patient), and there must be additional access reserved for staff and goods in the medical-nursing work areas and storage facilities.

Outpatient areas include:
- The outpatient area (1st, 2nd level clinics and maternal and infant health clinics)
- Support Services Area.
- Common reception and admissions area
- Technical rooms for technological equipment
- Spaces dedicated to telemedicine

Within the outpatient area, it is necessary to allocate some of the rooms to telemedicine and televisiting activities.
The outpatient area is divided into three types of clinics, divided into modules to improve operational efficiency through the management of flows and waits.

Suggested n	
60	Level 1 (*including telemedicine and televisiting*)
24	2nd Level
16	Maternal and Infant Health Outpatient Module

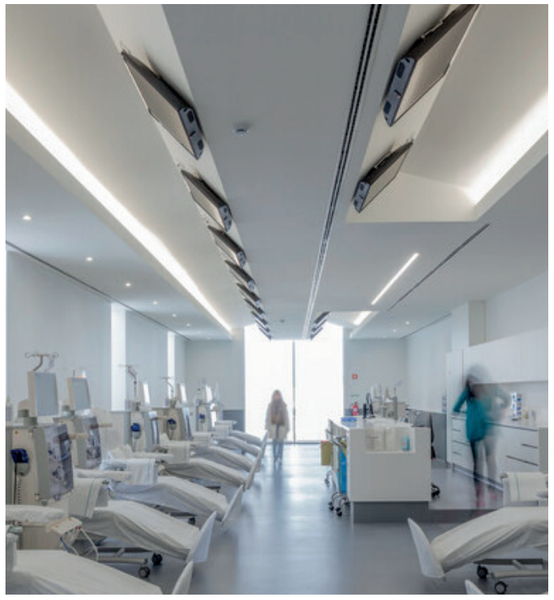
Pondok Indiah Bintaro Jaya Hospital, Silver T. Hanley (India)

Cantonal Hospital Uri Altdorf, Switzerland

DIALYSIS

The dialysis area provides therapies and treatment pathways for patients presenting kidney failure in the uremic phase, taking charge of them in the pre- and post-transplant phases. With respect to the treatments to be carried out, the user can log in several times a week. Hence, the functional area must be easy for users to access, with dedicated direct access and connection. Dialysis volumes are expected to increase compared to the current volumes of the two facilities. It is, therefore, necessary to define the size of the environment in line with this increase.
The areas of the dialysis centre include: dialysis area, service supports area, admissions and reception area, technical rooms for technological equipment.

Stations
40



Nefrodouro Hemodialysis Clinic, Portugal (2018)

SURGICAL INPATIENTS (SD)

The Day Surgery inpatient area consists of two modules accounting for a total of 35 beds. They include external users, often accompanied, for surgery or elective diagnostic or therapeutic procedures, with temporally limited hospitalisation. The area is equipped with dedicated surgical rooms and beds for immediate post-operative recovery, ensuring a safe environment for stabilising patients before discharge.
Areas of surgical day care include: inpatient rooms, healthcare support, support services, hotel support, technological equipment.

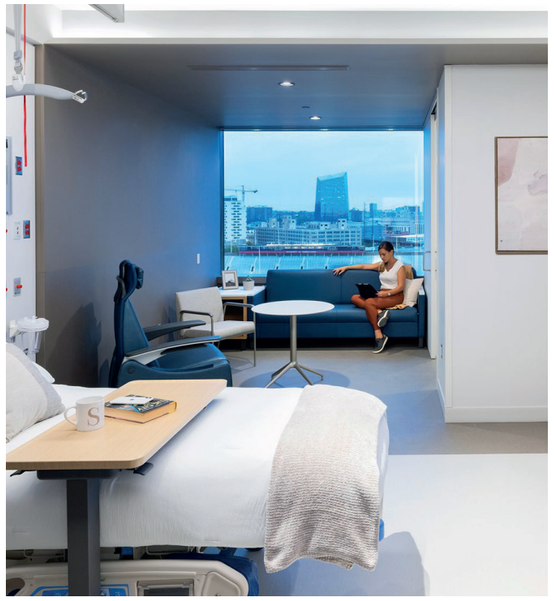
Beds
35

Waldkliniken Orthopedic Hospital, Germany (2020)

DAYCARE INPATIENTS (DH)

The medical daycare area provides multi-professional and multi-specialist diagnostic and therapeutic services that do not involve ordinary hospitalisation. The daycare inpatient area, being intended for external users, with an accompanying person, must be located in an area directly accessible to the public and in a separate and autonomous area with respect to inpatient areas.
The medical daycare area includes the following disciplines

SPECIALITIES	**BEDS**
Medical Area	26
Neurorehabilitation Area	9
Cardiology	2
Maternal Area	4
Haematology	8
Oncology	13
TOTAL	**62**



Penn Building, USA (2015)

BLOOD COLLECTION

The blood collection centre is intended to collect biological samples that are necessary for diagnostic and laboratory tests. The blood collection centre is differentiated from the laboratories in the hospital. It is mainly a service for outpatients, and given the large number of users expected, it must be located near the main entrance. The blood collection centre must have a strong spatial and functional relationship with the dedicated testing laboratories and pathways.

The **blood collection centre** includes:
- waiting area for admission;
- blood sample collection area, connected to laboratories, with storage and secretarial spaces;
- staff spaces, such as break rooms and changing rooms;
- blood collection area with sampling box, patient observation area and sample collection spaces;
- supporting spaces, such as storage facilities and equipment.

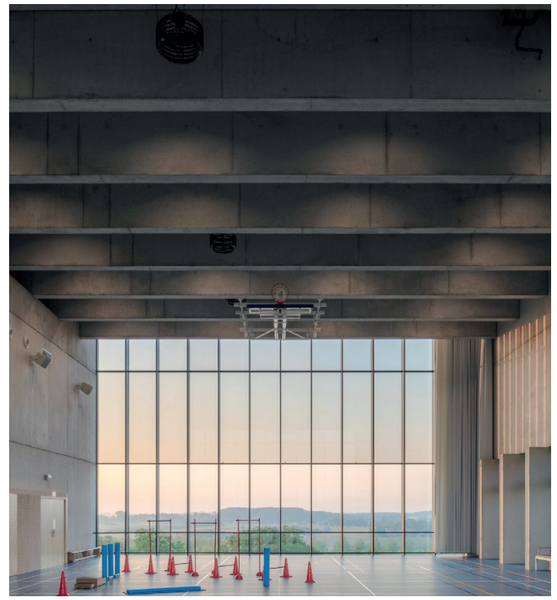
PRE-ADMISSIONS

The pre-hospitalisation service includes all the procedures and environments dedicated to the acceptance and preparation of patients who must be admitted to the hospital for medical and/or surgical hospitalisation or, in a daycare inpatient regime, in an outpatient setting.

The **pre-admissions** area may include:
- outpatient clinic with changing room;
- blood collection cubicles;
- specialist outpatient clinics;
- toilets for patients

REHABILITATION

The rehabilitation area is dedicated to the psycho-physical recovery of patients, with the aim of recovering functionality and autonomy. This area is reserved for preparation for surgery and immediate post-acute rehabilitation for inpatients or outpatients, pre or post recent hospitalisation, suffering from disabilities resulting, for example, from orthopaedic, neurological, pneumological, uro-gynaecological, cardiological or gastroenterological pathologies, and who need to undergo a recovery and/or rehabilitation programme and/or continuous stabilisation, with defined diagnosis and treatment plans.



Therapy Tower, Belgium (2017)

Diagnostic and Therapy Area

DIAGNOSTIC AND THERAPY AREA

Radiodiagnostics

Radiotherapy

Nuclear Medicine

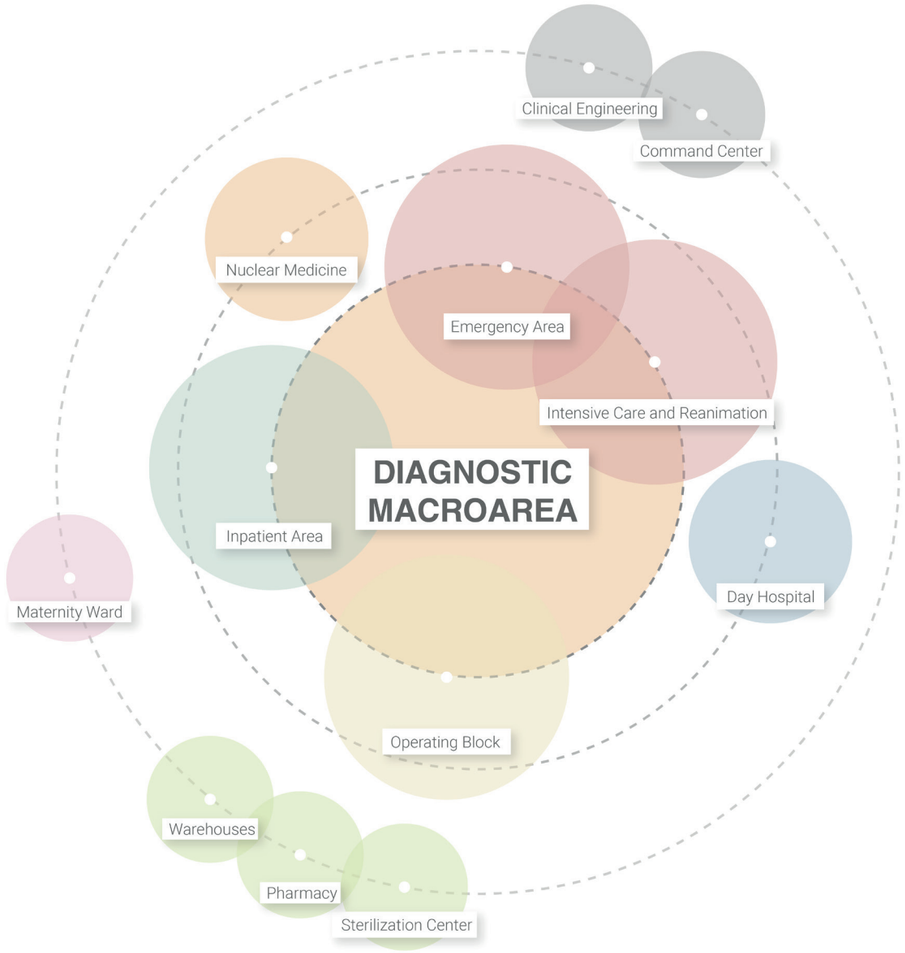
Buffer Space

General Requirements

The area dedicated to **diagnostics** and **therapy** is a crucial part of the hospital, being responsible for carrying out instrumental and imaging analyses that are useful to assess the clinical condition of patients, and to provide therapy and treatment services for the treatment of certain diseases that share the need for high technological complexity, the use of ionising radiation, and the consequent technological protection requirements.

Diagnostic Macro Area including key areas and activities such as radiodiagnostics, radiotherapy, health physics and nuclear medicine.

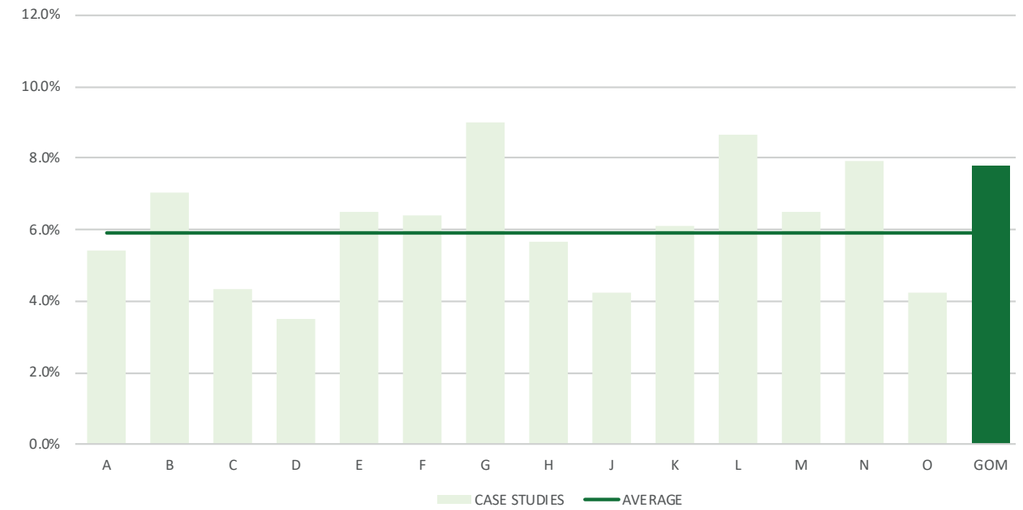
Diagnostic Room, example of humanisation in Paediatric Radiology

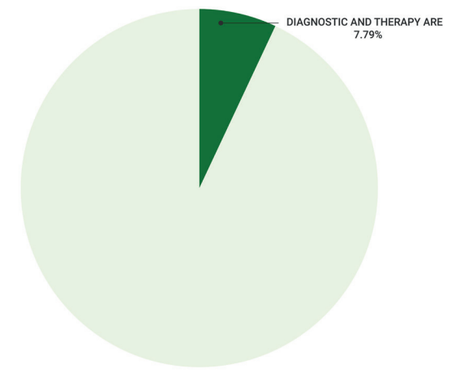


Diagnostic Area Proximity Radar

Functional and spatial relationships

The Diagnostic Area is designed to be a central and integrated node within the hospital, with functional and spatial relationships closely connected to both inpatient departments and critical and outpatient areas. Its strategic location ensures direct and rapid access for inpatients, outpatients and emergency patients, reducing transfer times and optimising internal flows. The area should be functionally connected to the emergency room for immediate management of emergency diagnostic examinations, such as X-rays, CT scans or ultrasounds, and to the operating block, to support intraoperative or preoperative diagnostic needs. Moreover, hospital stays will be able to have easy access to diagnostic services, ensuring continuity and timeliness in the clinical paths of inpatients. For outpatients, the diagnostic area is located near the daycare and outpatient areas, ensuring separate flows from inpatients and critically ill patients, thus preserving efficiency and comfort.





SURFACE

Radiodiagnostics	
Radiotherapy	
Nuclear Medicine	
Total	**7000 SQ.M**

Dimensional graphs of comparison with case studies and dimensioning of the Diagnostic Area

RADIODIAGNOSTICS

Diagnostic imaging units carry out diagnostic and therapeutic instrumental investigations, using ionising and non-ionising radiation sources and other image formation techniques.
The hospital service must ensure that activities are carried out under a programmed election or under an emergency procedure, and must comply with the regulatory requirements with particular reference to regional accreditation requirements regarding minimum structural, technological and organisational standards. In this regard, it should be noted that diagnostic imaging activities can be classified into first, second and third levels depending on the functions to which they are called upon to respond.
Each diagnostic room will be equipped with two passing changing rooms and toilet, as well as a dedicated control area; however it is possible to propose different aggregations, if considered more functional. Also for access to the rooms for imaging activities, filter changing rooms should be provided, differentiated for walking patients and stretcher patients.

Conventional diagnostic module: 11 rooms (7 x-ray and 4 ultrasound)
CT Module: 3 rooms
Senology module: 7 rooms
MRI module: 3 rooms

RADIOTHERAPY

The department provides for the presence of clearly differentiated areas: the outpatient area for visits and follow-up, a therapy area with bunkers for treatments and diagnostic studies aimed at treatments (CT-simulator, etc.). The main entrances will have to be two, one for outpatients and the other for inpatients and those transferred from other facilities; additional access is required for staff and goods (which may possibly have separate accesses). The reception/secretariat area will be set up at the patient access; after being admitted, the patient will be directed to the corresponding waiting area (outpatient area or treatment area).

There are 3 bunkers and a simulator.

Mutagens Foundation

NUCLEAR MEDICINE

The Nuclear Medicine Department requires a dedicated design based on the substances used emitting ionising radiation. In particular, this unit provides for the manufacture of substances for diagnostic purposes (radio drugs), diagnostic activity for outpatients and inpatients, therapeutic activity for outpatients and inpatients.
The service will have several separate entrances, one for patients in outpatient care, one for inpatients with dedicated waiting areas, and one dedicated to staff and goods.
The service is divided into two areas: a cold area consisting of waiting-admission, examination rooms and support services; and a warm area that coincides with the diagnostic area (treatment area), connected by filter to the warm area that is structured with a warm waiting room with its own controlled services, staff working area and laboratories, administration rooms, diagnostic rooms, properly filtered and plant engineering solutions controlled and isolated from the rest of the facility. Command and control areas will be set up outside the diagnostic rooms.
Four rooms must be provided. All rooms must be set up for handling diagnostic equipment (maintenance/replacement).

Mutagens Foundation

2 CT Spect
1 PET/CT
1 PET-MRI

BUFFER SPACE

It is necessary to define within the diagnostic area and the intensive care unit a buffer space that can be activated in case of emergencies and overcrowding.

Inpatient Area

INPATIENT AREA

Specialist surgical inpatients

Specialist medical inpatients

Maternal and Infant Heath Specialised Care

Semi-intensive specialist inpatients

Specialised neuro-rehabilitative inpatients

Special inpatients Paying patients

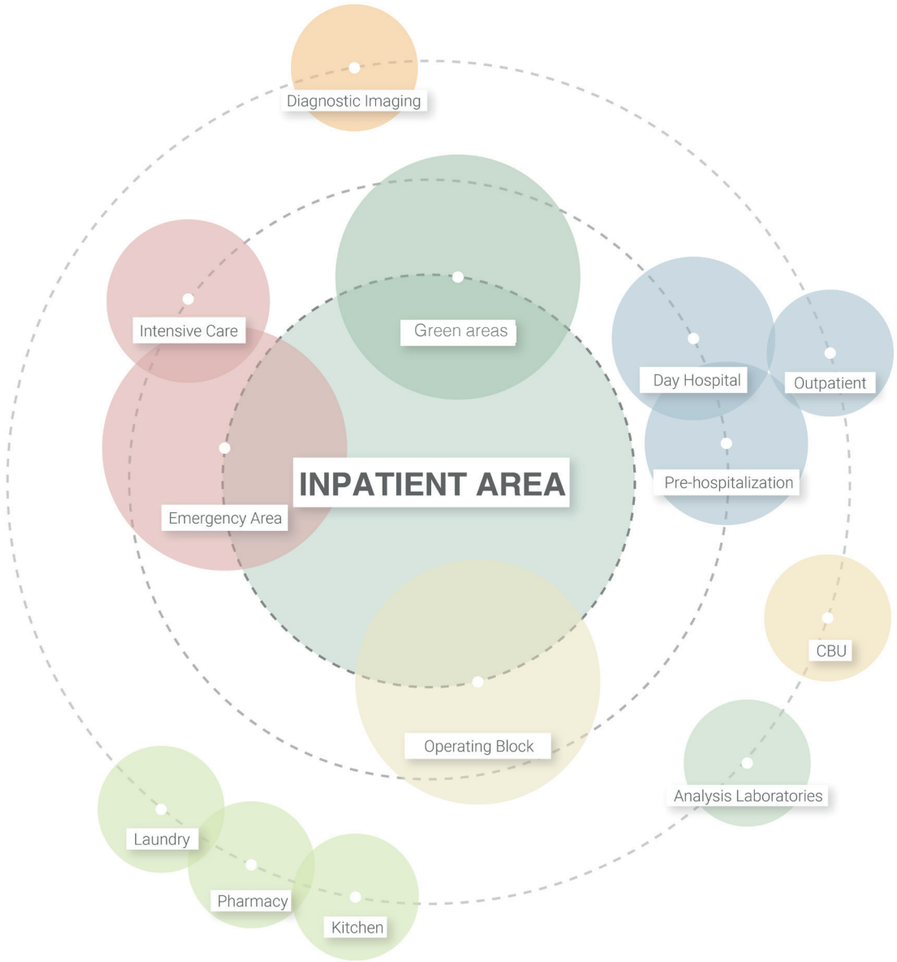
General Requirements

The area dedicated to inpatients is one of the most important areas of the hospital. Despite a progressive reduction of the total area in the historical and typological evolution of infrastructures for Health, the inpatient sector remains the main activity in terms of volume of the entire hospital complex.

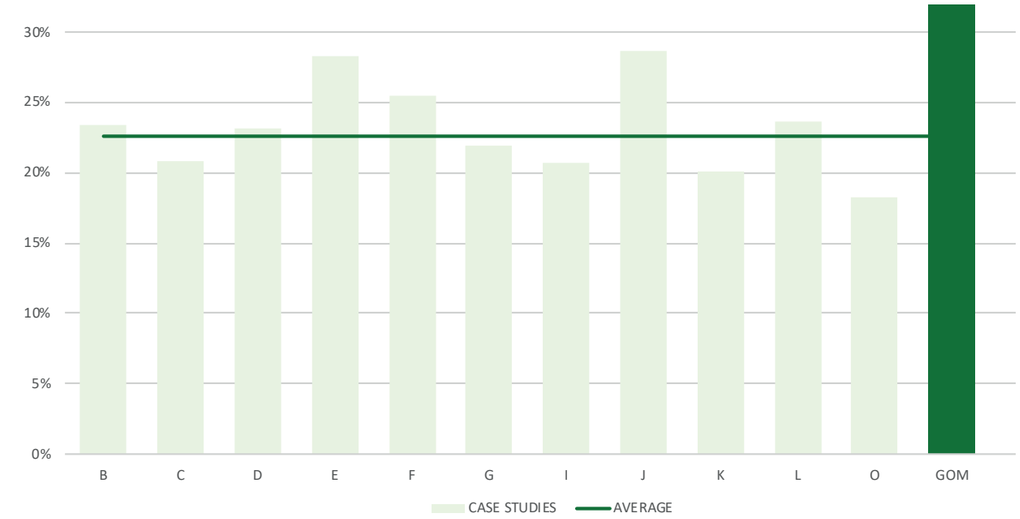
Indeed, inpatients account for the hospital area dedicated caring for and monitoring patients who require hospitalisation. The organisational model of the Great Malpensa Hospital provides for the division of inpatients into inpatient modules, organised into single rooms and double rooms; single rooms must have the possibility of being used as double rooms to allow the best balance between user welfare, privacy and containment of the risk of infections related to care, and the containment of volumes, and the efficiency of the care model. Overall, in case single rooms are developed, it is necessary to ensure the useful predisposition to increase the number of beds (1+1) in emergency situations and, in any case, the possibility of hosting a caregiver.

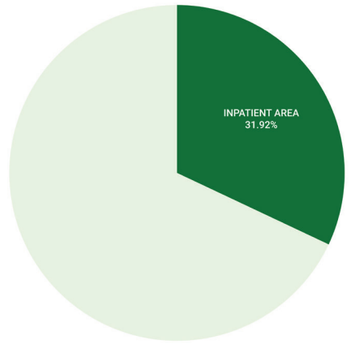
Allocation of the quota of single rooms will be favoured for inpatients requiring greater

Waldkliniken Orthopedic Hospital, Germany (2020)



Inpatient Area Proximity Radar





Dimensional graphs of comparison with case studies and dimensioning of the Inpatient Area

BENCHMARKS

SURFACE	
Total	**28700 SQ.M**

care and specialist complexity. These spaces are particularly suitable for surgical departments and long inpatient stays, where patient needs and the nature of care require greater attention to personalisation, safety and comfort.

Inpatient Room Requirements

Features of the inpatient rooms:

- It is necessary to integrate the model of inpatient rooms by providing solutions to ensure maximum flexibility of the structure both in emergencies and for the ordinary evolution of organisational and healthcare models.
- All inpatient rooms must be equipped with natural lighting and artificial lighting with adjustable intensity.
- All inpatient rooms can be equipped with accessible toilets, according to the standards of Universal Design and Design for All.

Functional and spatial relationships

From a **spatial** point of view, the inpatient macro-area can be placed in a more reserved position than the more intensive operational areas to ensure adequate levels of privacy and reduced public flows. Inpatients stays must be organised into well defined modules, and internal pathways must be designed to separate patients, staff, and material flows. Direct access to support rooms (e.g., department pharmacies, medical material storage rooms) and general services (e.g., cleaning, waste collection) are essential for smooth and discreet operation. It is important to provide spaces for interaction with family members and/or caregivers, such as waiting areas and interviews, strategically positioned to ensure privacy and comfort. It is also necessary to ensure proximity and spatial relationship with the equipped vegetation and spaces dedicated to the function of *healing garden*.

At the **functional** level, the inpatient units can be linked to critical areas, such as emergency rooms, intensive care units and operating block, to ensure the rapid transfer of patients requiring immediate care or complex interventions. At the same time, they will be able to maintain a direct relationship with the diagnostic area and laboratory medicine to ensure the timeliness of the examinations and analyses necessary for the monitoring and

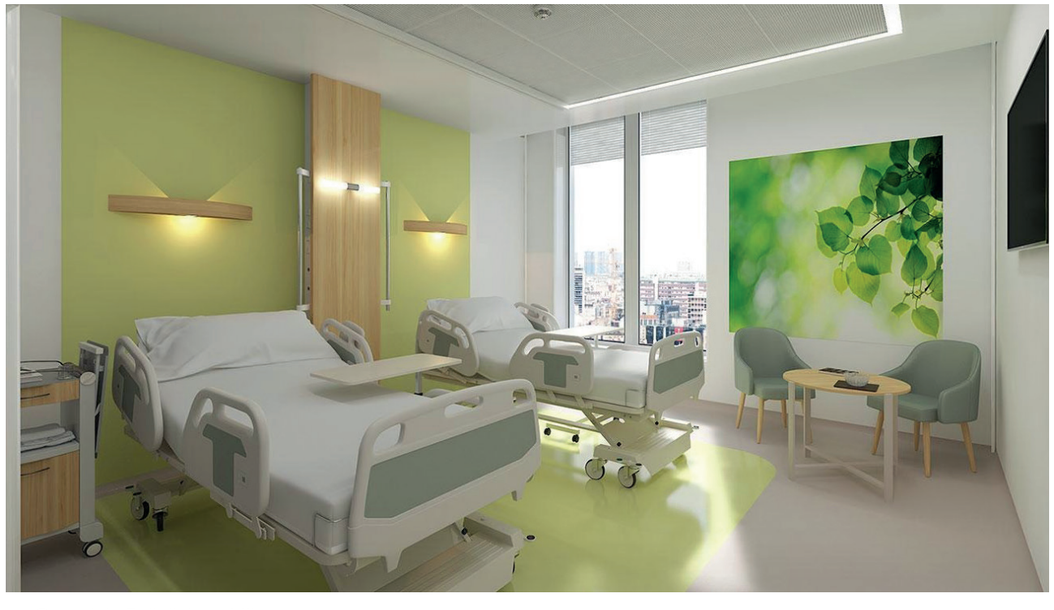
Equipment

The following types of inpatient stays are provided:

Type of inpatient stay	Beds
Specialist surgical inpatients	141
Medical specialist stays (+ cardiology, haematology and oncology)	249
Maternal and Infant Heath Specialised Inpatient Stays (2 modules of obstetrics and 1 paediatric and nursery module)	-35 obstetrics -20 Maternal Area -25 cots (technical beds)
Semi-intensive specialist inpatients	16
Specialised neuro-rehabilitative inpatients	72
Specialist inpatients - psychiatry	30
Special-paying inpatients	12
TOTAL INPATIENT BEDS	575

treatment of hospitalised patients.
It is also important to define the access modalities to the outpatient area to facilitate the paths of patients requiring continuous treatment or follow-up, avoiding interference with the flows of critical patients. The functional and spatial relationships of the inpatient macro area are based on a balance between strategic proximity to the operational areas and an internal organisation that favours patient comfort, safety and efficiency of clinical processes. The total inpatient surface area can also include spaces dedicated to departmental services or management, coordination and support functions for the optimisation of operations and development, training and research. It is suggested to provide spaces adequately sized to accommodate, for example, meeting rooms, open plan work areas, collaboration spaces, relaxation areas, medical offices, storage rooms, toilets, technical and support rooms.

Ospedale Policlinico, Milan



Ospedale Policlinico, Milan

Laboratory area

LABORATORY AREA

Clinical analysis, laboratory medicine and microbiology

Pathological Anatomy

Transfusion Centre

General Requirements

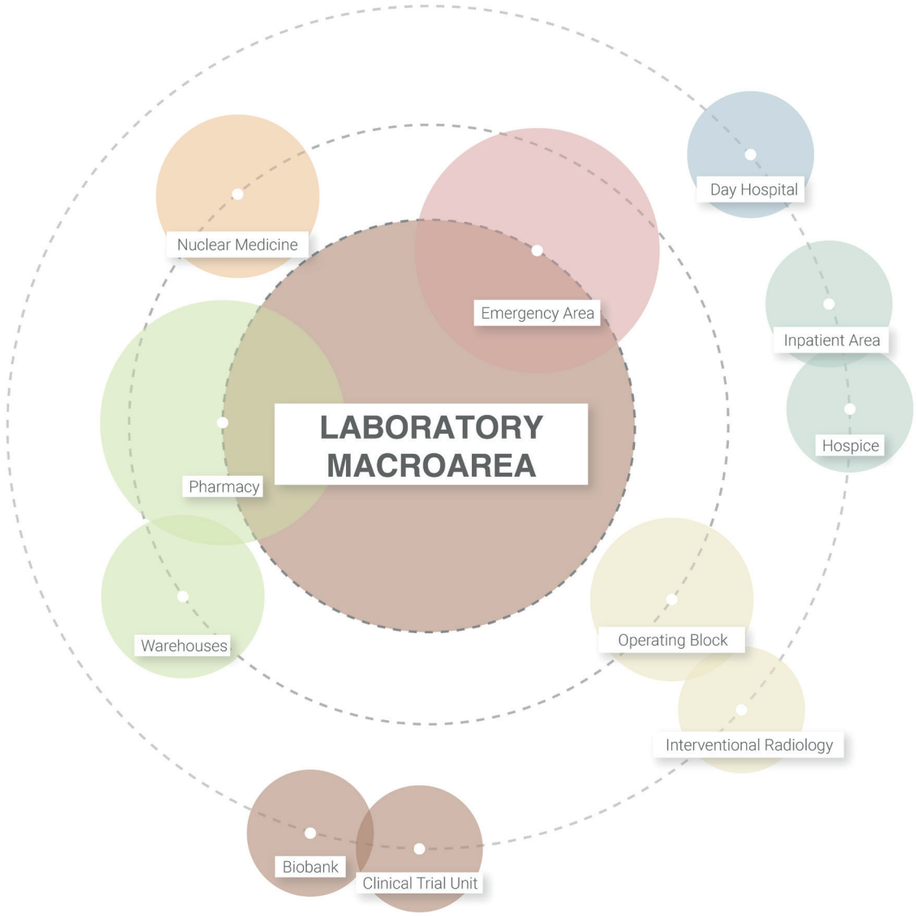
The Laboratory area is essential to support clinical pathways for diagnosis, monitoring and treatment of patients. Includes laboratories and sampling activities organised to ensure efficiency, accuracy and speed.

Equipment

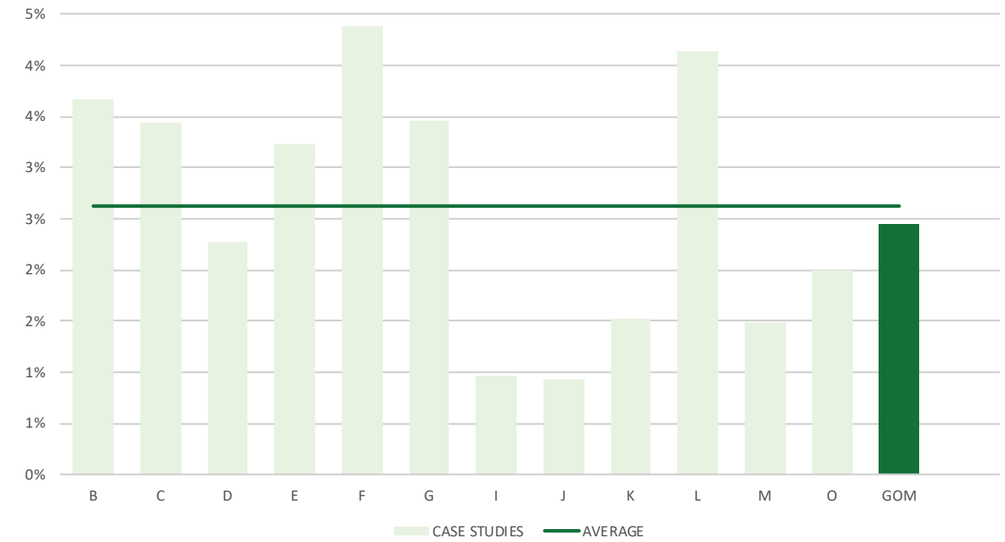
The laboratory area of the New Hospital is divided into the following three types of activities and functional areas:

- Functional area clinical analysis laboratory, Laboratory Medicine and Microbiology
- Functional Area of Pathological Anatomy

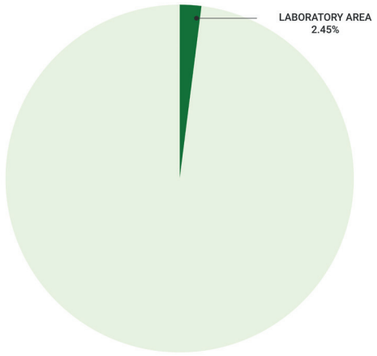
Great Ormond Street Hospital, London (2022)



Proximity radar of the Laboratory Area



BENCHMARK



SURFACE

Clinical analysis laboratory, laboratory medicine and microbiology	
Pathological Anatomy	
Transfusion Centre	
Total	**2200 SQ.M**

Dimensional graphs of comparison with case studies and dimensioning of the Laboratory Area

Zayed Center for Research into Rare Disease in Children, London (2022)

CLINICAL ANALYSIS LABORATORY, MEDICINE AND MICROBIOLOGY

For the functional area clinical analysis laboratory, Laboratory Medicine and Microbiology includes the Laboratory areas (chemical-clinical analysis). The location of these laboratories must be guided by organisational and functional aspects and must ensure:

• priority routes with operating blocks (extemporaneous analysis);

• optimal connections with the various hospital operating units;

• the highest level of integration with the remaining laboratory services;

The area is crucial in contemporary hospitals, and an increase in laboratory activity in the hospital of the future is expected. It is, therefore, necessary to guarantee and identify environments dedicated to possible future expansion of the business.

Waiting and admissions are provided for access to the service.

In particular, the area must contain: laboratory area with admissions and sorting of samples, sample storage area, cold room, service and departmental supports.

PATHOLOGICAL ANATOMY

The functional area of Pathological Anatomy included in this intervention includes the Laboratory areas and Departmental areas of relevance.

The location of these laboratories must be guided by organisational and functional aspects, and must ensure:

- priority routes with operating blocks (extemporaneous analysis), endoscopic diagnostic services, interventional radiology and outpatient surgeries that collect samples for analysis;
- • optimal connections with the various hospital operating units;

Laboratory, Alba-Bra Hospital Foundation (2020)

BLOOD TRANSFUSION CENTRE

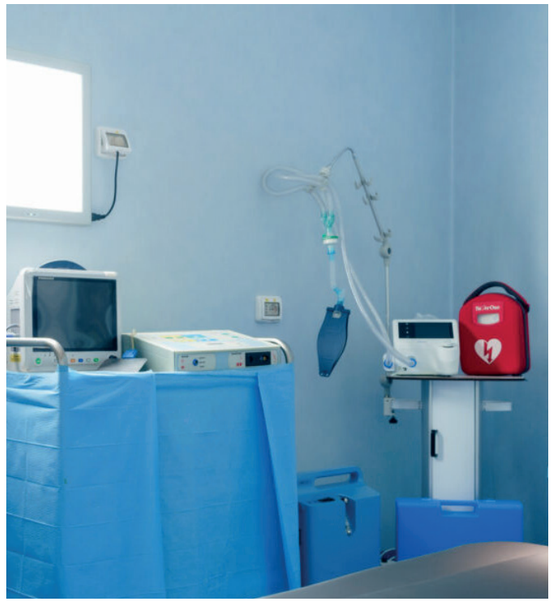
The Blood Transfusion Centre includes both the donation and treatment area and the related laboratories/blood bank (control area, handling, storage of blood and blood products, etc.) and the related management area. Waiting and admissions are provided for access to the service.

The general principle to be followed is to place the area in a position accessible to external users, mainly donors, with dedicated paths and distinct from those for internal users.

Each donor station must be equipped so that the patient can sit or lie down during the blood collection, ensuring privacy. The unit must be equipped with a blood collection and donation module and a room for emergency-urgency management.

The main supports of the Blood Transfusion Centre are divided into:

- Healthcare Supports: clinic for visits and preliminary checks; post-donation room for the recovery and surveillance of users after the blood collection or donation; areas for healthcare staff, healthcare staff preparation and management of activities related to donations and withdrawals.
- Logistics service supports: areas dedicated to the handling and storage of materials, devices and tools used during collection and processing operations; rooms for the management of blood bags, ensuring compliance with hygiene and cold chain regulations.
- Departmental supports: medical rooms and premises for medical and nursing staff, necessary for coordination and supervision activities; spaces for staff training and administrative and documentary management of the centre.



Transfusion Centre

Macro Area General Services

MACRO AREA GENERAL SERVICES

Management and administrative services

User and visitor reception

Staff reception

Central sterilisation

Pharmacy

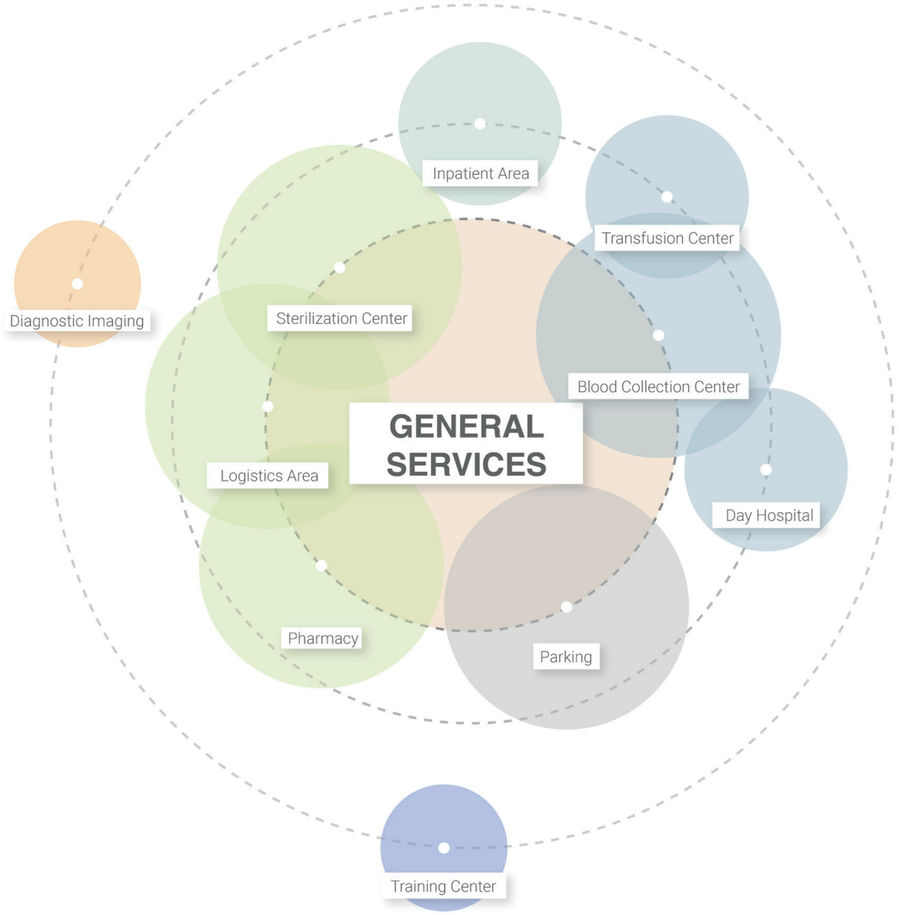
Morgue

General Requirements

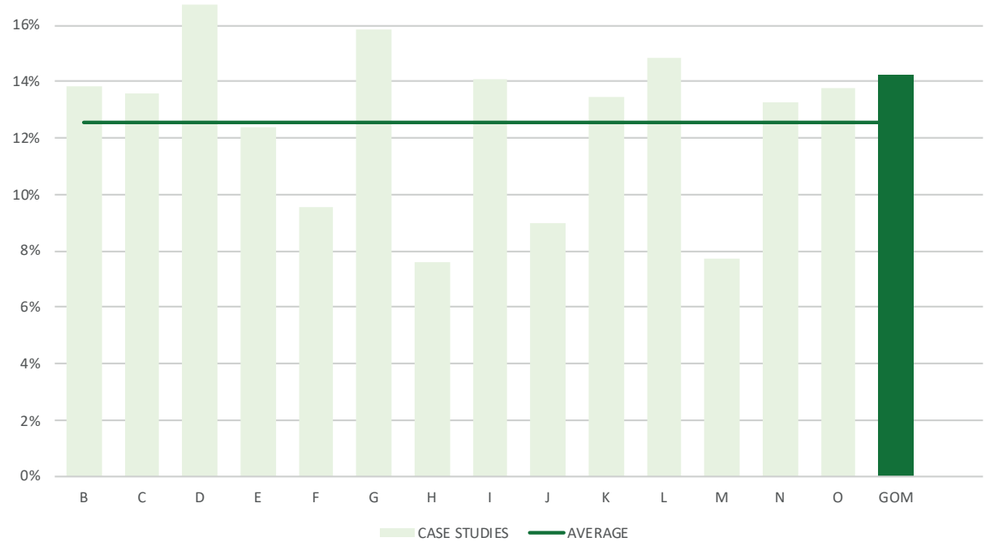
The General Services Area is one of the most dimensionally relevant areas in a contemporary hospital, and particularly relevant for the project of the New Great Malpensa Hospital. This macro area of a hospital includes a number of functions and cross-sectional spaces, which are essential to ensure proper operation of the facility and organisational and operational support to healthcare activities. This macro area is not directly involved in the delivery of clinical care, but provides essential services for both staff and users.

The aggregation of general services expresses the need and opportunity to optimise the spaces supporting healthcare activities. The functional relationships of the various areas must respect the logistic (e.g., pharmacy) and healthcare (e.g., morgue) proximity, identifying the correct separation of the paths according to the general philosophy of the project.

Queen Silvia, Sweden (2021)



Proximity radar of the General Services Area



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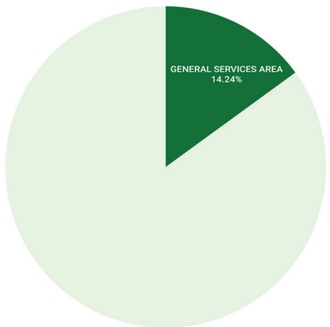
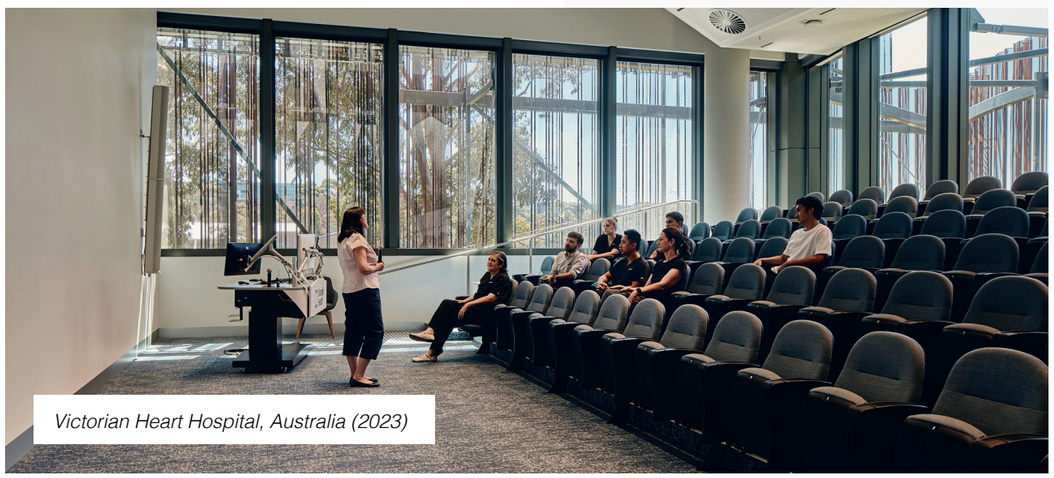


Dimensional graphs of comparison with case studies and defining the size of the General Services Area

SURFACE

Management and administrative	
User and visitor reception	
Staff reception	
Central sterilisation	
Pharmacy	
Morgue	
Total	**12800 SQ.M**



Victorian Heart Hospital, Australia (2023)

MANAGEMENT AND ADMINISTRATIVE SERVICES AREA

It is suggested to place the Executive and Administrative Services Area in a single area easily accessible from the outside, with separate paths and entrances and, in any case, functionally connected to the acute care areas, to facilitate communication between health and administrative management areas.
It is necessary to place the area in strategic proximity to enhance efficiency of the path of the technical and administrative staff of the hospital, in close spatial relationship with the staff parking area.

RECEPTION AREA FOR USERS AND VISITORS

It is recommended to place the Reception Area on the entrance floor of the new facility. The area includes all the functions of front office, reception and information to users, and the services of admission, collection of reports, communication of associations, commercial and catering spaces and areas of worship, as well as a library with reading room.
The area must feature a high level of comfort. It is necessary to provide for the presence of natural elements, and natural lighting is preferred. Particular care must be taken to ensure and monitor accessibility to all users, according to the principles of Universal Design and Design for All.

STAFF HOSPITALITY AREA

This area is located to ensure separate access for operators entering and exiting the healthcare facility, with central changing rooms and the possibility of easily reaching dedicated refreshment areas.

TRAINING CENTRE

The teaching/training centre includes spaces dedicated to the management and implementation of internal and external training activities, the management of conferences and the organisation of specific training and teaching programmes for medical and nursing staff.

Hôpital du Sacré-Cœur-de-Montréal, Canada (2022)

STERILISATION CENTRE

It is suggested to place the Sterilisation Centre in close functional connection with the critical areas and the main operating block. The sterilisation unit area must facilitate a clear separation of workflows to avoid cross-contamination, and must include: the “dirty”/contaminated zone, the sterilisation operating zone, and the “sterile zone” distribution area.

MORTUARY “MORGUE”

The service can be divided into two distinct areas: one intended for the display of the bodies, the reception of family members and the funeral hall (this area must have direct access from the outside with a reserved parking lot), the second must be allocated for the preparation and preservation of the bodies with support storage areas. The morgue must be easily accessible from the outside, and a dedicated access must be defined.

PHARMACY

The pharmaceutical service can be divided into two operational sub-modules:

- the first intended as a **pharmaceutical storeroom**, intended for the storage and delivery of bulky materials to healthcare areas. The function can also be placed in the logistics area to optimise the goods loading and unloading areas, registration and storage, and operation of the automated system for sending drugs to the department
- the second for laboratory activities for **drug preparation**, central preparation of antiblastic drugs, parenteral preparations and delivery of drugs to wards and patients for special therapy cycles. In this area there is also the presence of the premises of the Pharmacy management with departmental administrative support.

Paradise Valley Hospital Pharmacy, USA

Macro Area Logistics Services

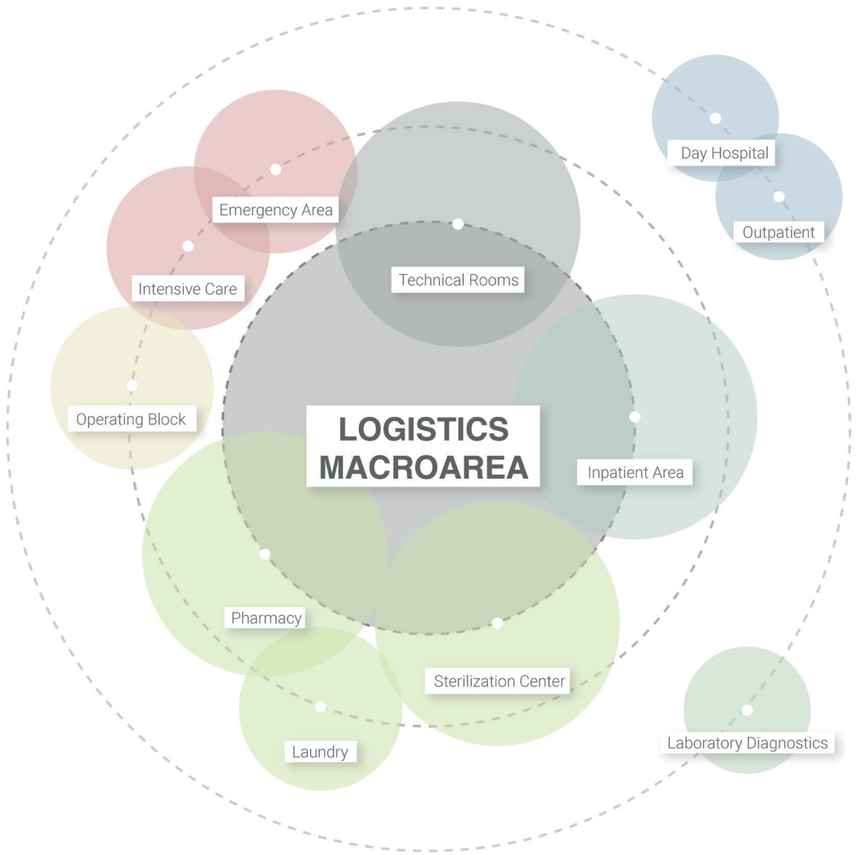
MACRO AREA LOGISTIC SERVICES

General Requirements

The logistics services area consists of areas dedicated to clinical engineering and healthcare technologies, kitchen, cleaning services, stable maintenance offices, economical storerooms and the ecological island. The logistics area is planned to be located in a different area but connected to the healthcare area to define a single floor/technical – logistics building that will then have the opportunity to exploit the same logistic accesses sized for road haulage vehicles, goods loading and unloading yards, and to ensure compliance with noise impact parameters.

The ecological island that must carry out the separate disposal service may also be envisaged adjacent to the logistic accesses. The area of the economical, pharmaceutical storerooms (for large volumes) and for the unloading of laundry, will have to be served by a loading dock that allows trailers to draw near.
Once again, the efficiency of the system is guaranteed by separate accesses and, as much as possible, by reducing interference with the internal viability of the hospital. It will thus be possible to optimise the transport and use of machines that can perform the various services

Poliambulanza Foundation, Brescia (2017)



Logistics Area Proximity Radar

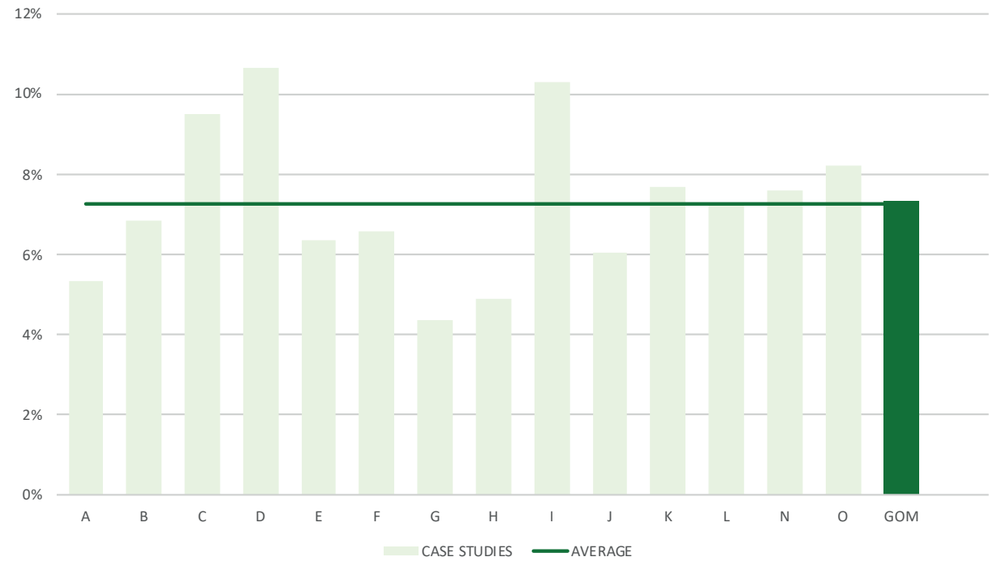
at different times of the day.
The location of the logistics and technological area must ensure ease of access and minimum interference with the creation of any new expansion volumes, the maintenance of operations based on a single supply circuit ensuring adequate transport times, as usually scheduled in the volumes and hours of service.
The laundry room will be outsourced, and there will, therefore, be no space for this service.

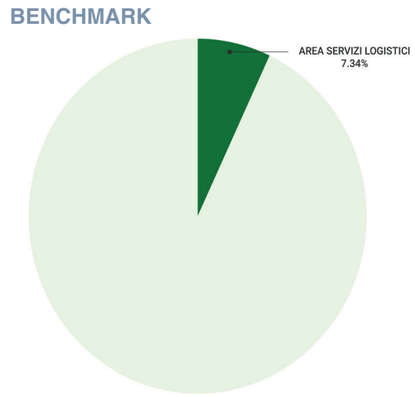
Internal hospital handling mode and automated transport

Two modes of automated distribution of goods should be provided for:

- Transport by pneumatic mail (documents, biological samples, medications)
- Automated transport with automated guided vehicles (AGVs).

Pneumatic mail systems: stations must be provided in each inpatient unit, in clinical laboratories, in the operating block, in each unit of research laboratories, in each administrative area, and in some appropriately





SURFACE

Total	**6600 SQ.M**

Dimensional graphs of comparison with case studies and dimensioning of the Logistics Area

prepared areas of the clinics. The system will, however, have to allow expansions and reconfigurations according to organisational and structural developments.
Transport system with AGV: the heavy transport system will consist of a series of Self-Guided Vehicles programmed to move trolleys between the logistics areas (sources) and the departments/services of the hospital facility (destinations). AGV devices will pick up (standard) trolleys to be transferred in their final direction. Dedicated routes must be defined for internal handling via AGV between the logistics areas and the service departments involved.

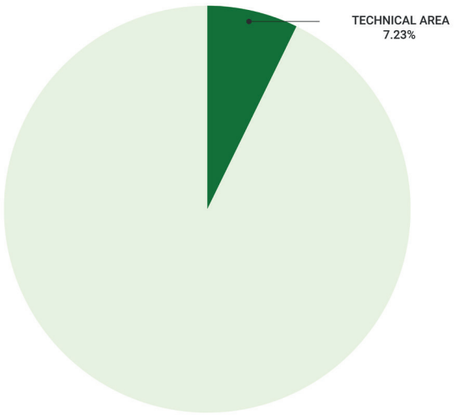
Macro Area Technical Rooms

MACRO AREA TECHNICAL ROOMS

General Require-

The macro area of the technical rooms includes spaces dedicated to the facilities and infrastructures that guarantee the operation and operational support of the hospital. It includes areas for electrical, plumbing, air conditioning, ventilation, fire safety, and information technology systems, as well as spaces for maintenance and waste management personnel. Strategically located in peripheral or underground areas, this macro area is designed to operate efficiently and discreetly, ensuring continuity and safety of hospital services without interfering with clinical activities.

New Surgical and Urgency Centre, San Raffaele Scientific Institute for Hospitali-



SURFACE	
Total	**6550 SQ.M**

Dimensioning of the Area for Technical Rooms

Functional and spatial relationships

Spatially, these premises are generally located in peripheral, underground or isolated areas, but also between floors or in roofs, to reduce the risk of interference with main hospital flows. These areas should include separate accesses, reserved for technical staff and suppliers, as well as dedicated routes for the safe transport of materials and equipment. In addition, their design must ensure optimal proximity to critical areas, such as operating block, intensive care and diagnostic areas, to minimise intervention time in case of failure or emergency.

Victorian Heart Hospital, Australia (2023)

3.2
Design Requirements

Localisation and Relationships with the context

Appropriate strategic location can facilitate urban regeneration processes and improve accessibility to healthcare services, helping to create a resilient and inclusive medical ecosystem.

Volumetric development

The hospital must be designed according to a horizontal and compact volumetric model.

Flows, Paths and Access

Management of flows and routes is essential to ensure operational efficiency and safety. It is necessary to divide the flows of daytime users and visitors from those used by hospital staff and patients on stretchers from the freight route.

Flexibility, Resilience and Modularity

An adaptable hospital, able to quickly modify its structure to respond to changes in context and needs, thanks to spatial flexibility strategies, modular construction techniques, and adaptable plant strategies.

Differentiation according to user and Design for All

Hospital design must respond to the physical, psychological and social needs of users, adopting an integrated approach.

Single rooms

The single room, with a predisposition to become double, can guarantee privacy, flexibility and security for the hospital sector.

Healing environments

Recreation areas dedicated to recovery and well-being must be designed in healthcare facilities, including spaces for physical exercise and games that promote psychophysical health, and areas where patients can interact socially and recover in a natural environment.

Wayfinding

Strategic element to improve operational efficiency and user experience.

Environmental sustainability

Sustainability is a pillar of hospital design with a focus on energy efficiency and on reducing environmental impact. Hospitals need to reduce their impact and monitor levels of environmental, economic and social sustainability.

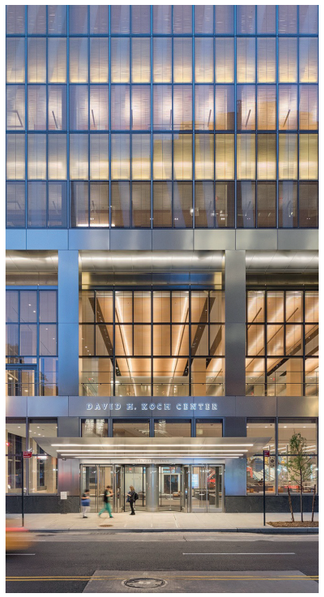
Technology and digitisation

The New Hospital must ensure the integration of technology and processes in order to promote operational efficiency, safety and sustainability. It is, therefore, necessary to define solutions and physical environments dedicated to the management of increasing technological complexity.

Monitoring and evaluation

Monitoring and evaluation are crucial elements to ensure that the New Hospital meets the expected quality and operational standards.

Localisation and Relationships with the context



New York-Presbyterian David H. Koch Center, New York, USA (2018)

The functional orientation of the "New Hospital of Busto Arsizio and Gallarate" is a crucial step in the planning decision-making process, with profound implications for environmental, social and economic sustainability, as well as for the efficiency of social and healthcare services. An appropriate strategic location can facilitate urban regeneration processes and improve accessibility to healthcare services, helping to create a resilient and inclusive medical ecosystem. In order to optimise the functional orientation of the New Hospital, it is necessary to integrate considerations on the accessibility of users and staff, also the analysis of supply and external services used by the hospital.

Urban context

The location of a hospital directly affects the urban context, becoming a landmark for both the community and the local healthcare system. The location of a hospital facility must take into account several factors:

- The reception of a wide variety of users;
- The large dimensions of the building;
- Its impact on the economic supply chain.

Design must promote functional integration with the urban fabric, avoiding, as much as possible, traffic congestion, especially in healthcare emergency contexts, as demonstrated by the recent COVID-19 pandemic. Choosing a location on the border between urban and peri-urban areas can ensure a balance between accessibility of health services to people from different areas, control of flows and limiting the risks associated with densely populated areas. In addition, this location offers the possibility of developing a flexible and expandable hospital system, which can quickly adapt to future needs. Conversely, integrated functional facilities will be made available in the city centre to provide an advanced level of healthcare services, including primary care, prevention and neighbourhood-scale healthcare promotion services, promoting the concept of city proximity urban planning.

St. Olav's Hospital, Nordic, Norway (2013)

Accessibility

Adequate accessibility is a prerequisite for the success of a healthcare facility. A modern hospital must promote sustainable mobility strategies, including modal interchange hubs, pedestrian and cycle paths, as well as flexible and adaptable parking. The location of the New Hospital of Busto Arsizio and Gallarate, connected to the main roads and public transport, will have to ensure easy access to both patients and all staff, especially medical and caregiving staff, while minimising the environmental impact.

Integrating shared mobility hubs, such as secure bicycle parking and electric vehicle charging areas, will not only improve accessibility, but also promote healthy lifestyles that are sustainable for the whole community.

Maasstad Hospital, Rotterdam, The Netherlands (2011)

Territorial Social and Healthcare Network

The New Hospital will be part of a territorial social-healthcare network that integrates hospital facilities and primary care services. This synergy allows homogeneous distribution of healthcare services, reducing overcrowding and improving the resilience of the system. Proximity and facilitated access can encourage people to take advantage of healthcare services, reducing geographical disparities and improving the overall quality of healthcare.

The proposed hospital model provides for the relocation of some services and the prevention and promotion of health and well-being in territorial or domestic structures, in line with the principles of proximity and digitisation of the healthcare system. This configuration will help reduce the load on the central facilities, improving the efficiency and effectiveness of the service.

Central Hospital in Karlstad, Sweden (2023)

University Hospital Basel, Switzerland (2019)

Landscape integration

Another fundamental aspect insertion of the hospital in the landscape, which must be designed in continuity with the natural and urban context. Vegetation is not only an aesthetic element, but an essential factor for the psychological and physical well-being of patients and staff. Recent studies have shown that the presence of green spaces and therapeutic gardens can significantly improve patient recovery and reduce staff stress.

Volumetric development

SJD Pediatric Cancer Center, Spain (2022)

The New Hospital will be designed according to a horizontal and compact volumetric model, with a maximum limit of five floors above ground for areas with greater technological complexity. This approach facilitates the healthcare organisation, allowing the creation of autonomous functional units that can operate independently both in ordinary conditions and in emergency situations, increasing the resilience of the system.

Horizontal Configuration

Horizontal configuration reduces travel distances, optimising the distribution of internal functions and routes. This arrangement improves operational efficiency and user experience, with a macro area division that clearly distinguishes healthcare functions from technological-logistic ones. This organisation ensures more orderly flows and shorter travel times, improving the effectiveness of daily operations.
In addition to operational efficiency, the horizontal model offers psychological benefits. Studies show that healthcare buildings with a low height improve orientation, reduce anxiety and create a less intimidating environment for patients, thereby improving the overall experience.
This configuration also contributes to a more harmonious landscape integration, enhancing the surrounding natural context and promoting the psychophysical well-being of users.

Autonomous Functional Units

A distinctive element of the project should be the creation of autonomous functional units. These modular cores offer flexibility in managing clinical and logistic activities, enabling rapid response to emergencies, pandemics or peak demand. Each core ensures business continuity and the ability to tailor care to the specific needs of patients, improving efficiency and quality of service.

Papa Giovanni XXIII Hospital LHA, Bergamo

Resilience and Sustainability

The focus on volumetric and space configuration is not limited to operational efficiency. These principles support the creation of a resilient and sustainable structure, capable of adapting to future challenges that may include technological developments, climate change and new healthcare needs. The integration of architecture and landscape not only improves environmental quality, but also contributes to the overall sustainability of the hospital.
It is necessary to enhance design solutions that avoid excessive oversizing of hospital spaces, optimising environments to ensure functional efficiency, reduce resources used and limit soil consumption, with a view to economic and environmental sustainability.

Flows, Paths and Access

Hospital del Mar, Spain (1992)

Separation of Flows

Hospital flow management is critical to ensuring operational efficiency and safety. Differentiation of flows for patients, staff and goods minimises interference and reduces contamination risks. The entrances must be separated by type of user, with distant accesses for outpatients and emergency cases, and independent driveways for emergency vehicles and ordinary users. They are fundamental for correct and efficient management of the main diagnosis and treatment processes, which in modern medicine are multi-specialised and integrated into teams, also composed of operators from different disciplines that must be easily interconnected.

Public pathways

Public and technical-healthcare pathways perform different functions and must be clearly separated. The inner main street, the main axis for patients and visitors, requires a suggested width of 8 meters to ensure a smooth pedestrian flow. The technical-healthcare path, with a suggested width of 3 meters, extendable to 4 in critical areas, is intended for the transport of stretcher patients and medical materials, ensuring safety and operational efficiency.

Spatial Optimisation

Internal corridors of healthcare areas must be designed to facilitate efficient use of spaces. With a suggested width of 2.5 meters, they can include niches to facilitate the rotation of stretchers and prams, improving fluid movement and accessibility. This approach optimises spaces without impairing functional features.

Logistics and Automation

Managing logistic flows, including drugs, equipment and waste, requires advanced systems. Dedicated elevators for medical materials and waste must be strategically located to avoid interference with patient and visitor routes. The integration of automated systems, such as pneumatic mail and self-driving vehicles, ensures fast deliveries and reduces congestion.

New York-Presbyterian David H. Koch Center, USA (2018)

Waste Flow

Particular attention should be paid to waste streams, especially infectious waste. Separate routes and temporary storage areas along technical routes are essential to minimise contamination risks, improving logistic efficiency.

Secondary Access

In addition to the main entrances, secondary access points for personnel and goods are required. These access points must ensure independent flows, avoiding interference with the main routes. Critical areas, such as the emergency room, require dedicated routes to allow quick access to urgent treatment areas, reducing intervention time in emergency situations.

Royal Adelaide Hospital, Australia (2017)

Strategic Vertical Links

In the scene of healthcare infrastructures, the efficiency of vertical connections is crucial. Separate lifts for patients, staff and cargo must be deployed strategically to ensure speed and safety of movement. In critical areas, direct links between emergency department, intensive care unit and operating block are essential for timely emergency management.

Integration and Accessibility

The design of flows, routes and accesses must ensure a balance between operational efficiency, safety and comfort for all users. Every detail, from the width of corridors to the layout of entrances, must be carefully planned to meet the specific needs of patients and staff, while offering flexibility and adaptability to future needs.

Copenhagen University Hospital, Denmark (2015)

Flexibility and Modularity

Fiona Stanley Hospital, Perth, Australia (2014)

The healthcare sector is constantly evolving, requiring flexible and adaptable hospitals to respond to technological, demographic and emergency changes. The design of the New Hospital is based on an approach that integrates flexibility and modularity, ensuring easy reconfiguration of the structure thanks to prefabricated systems, versatile layouts and scalable systems. Multipurpose spaces and adaptable pathways ensure optimised use of resources, making the hospital a ready platform for future needs.

The level of flexibility of a hospital complex includes several key aspects:

- At the hospital complex level: It includes the functional flexibility of the system, the implementation of interconnected information systems, automation and process control, the possibility of reusing the hospital complex, the availability of building land for future extensions.
- At the building level: It includes the presence of rustic areas for future expansions, the oversizing of supporting structures, façades prepared for modifications, modular systems that are replaceable and easily maintained.
- At the functional unit level: It involves the use of movable interior walls (dry) and wall mounting systems, the presence of spaces for the technical services infrastructure, the possibility of extending the entire functional unit vertically or horizontally, and the design of environments that guarantee flexible use.
- At the level of inpatient rooms: It includes the functional flexibility of the rooms, the possibility of vertical and horizontal extension, the use of multifunctional rooms, integrated plant engineering and information systems, mobile furniture and vertical screens to customise and humanise the environment.
- Buffer and support spaces: They should be planned between departments to allow for expansions, reconfigurations or the creation of isolation areas.

Martini Hospital, Groningen, The Netherlands (2007)

- Convertible functional areas: The inclusion of easily reconvertible areas for use in emergency situations or for different functions is recommended, including non-medical areas that can be transformed and equipped with minimal investment.

Modularity

Modularity is a crucial functional requirement in hospital design as it guarantees operational flexibility, adaptability and sustainability over time.

A modular approach allows the hospital to be divided into independent but interconnected functional units, facilitating the expansion, reconfiguration or replacement of specific areas in response to evolving technologies, increasing healthcare demand or changing care models.

This principle is particularly relevant for critical areas, such as operating block, diagnostics and intensive care, which need to be able to

Rambam Health Care Campus, Haifa, Israel (2014)

be upgraded or reorganised to ensure continuity of hospital activities.
The modular design of a hospital also involves the division of the structure into standardised or repeatable units, called modules, designed to be independent but interconnected. This method allows you to create flexible, adaptable and efficient spaces, responding to the immediate needs of the hospital.

Inter-floor heights and structural grid

The guarantee of a minimum inter-floor height is a fundamental aspect of flexibility to ensure future expansion of the healthcare activity, and to intercept changes from a plant engineering point of view. It is suggested to define an inter-floor height to ensure future expansions and a possible increase in complexity. Recent trends suggest heights of 5 m to ensure flexibility even in the most critical areas.

Operational Adaptability

Flexibility is an essential pillar in contemporary hospital design, allowing healthcare facilities to quickly adapt to changing clinical, technological and operational needs, ensuring continuity of services in both ordinary settings and emergency situations. This principle, which is essential for long-term sustainability, is articulated on different design levels, starting from processes and reaching individual functional units. At the process level, flexibility is expressed through agile project management, flexible contractual arrangements and public-private dialogues that ensure adaptable planning and effective responses to unexpected events.

Flexible plant engineering system

MEP (Mechanical, Electrical and Plumbing) systems must also be designed to ensure high flexibility and future adaptability, just like the construction system. The plants are optimised to maximise energy efficiency with technical arrangements that allow subsequent implementations and customisable configurations. The entire plant engineering network is designed to allow remote or automated monitoring and management of microclimate parameters, thanks to adequate sensors and advanced digital control systems. These systems are integrated with the digital twin of the New Hospital, offering an advanced technological infrastructure for personalised control and operational optimisation.

Programmable Expansion

In the building context, flexibility is expressed in the preparation of building areas for future expansion and in the reuse of existing spaces. The presence of rustic spaces and modular façades allows non-invasive interventions to adapt the hospital to new needs, minimising operational inconvenience. In individual functional units, movable walls and modular systems allow the reconfiguration of spaces, for example the transition from operating rooms to intensive care units, ensuring business continuity even in emergency situations.

Clinical Personalisation

Another aspect of flexibility concerns the multifunctional feature of inpatient rooms, which must be designed to accommodate not only patients but also caregivers. These rooms, sized as double rooms, can be quickly converted to meet specific clinical or family needs,

Sheikh Khalifa Medical City, Abu Dhabi, Arab Emirates (2015)

Martini Hospital, Groningen, The Netherlands (2007)

offering more humane and customisable spaces. The COVID-19 pandemic has highlighted the importance of operational resilience: examples such as Rush University Medical Center in Chicago, which was able to quickly reconfigure its emergency room and create temporary isolation rooms, or Rambam Hospital in Haifa, which transformed an underground parking lot into a 2,000-bed hospital, demonstrate how flexible design is crucial to addressing health emergencies in a timely manner.

Buffer Space

Buffer spaces are another key element for flexibility.
Located near critical departments such as the emergency room, these spaces can be quickly converted into operating rooms or diagnostic areas, ensuring immediate response to peak demand. Equipped with plant predispositions, these environments offer a valuable resource to maintain business continuity even in high pressure conditions.

Dynamic Prefabrication

Construction modularity is another essential element: prefabricated systems allow entire functional blocks to be added or removed without interrupting operations. Martini Hospital in the Netherlands is a significant case study as it uses easily reconfigurable modules to accommodate new functions without renouncing service quality.

Plant Engineering Accessibility

From a structural point of view, flexibility is achieved through solutions such as floating floors and movable partition walls, which facilitate rapid access to electricity, water and communication networks. These measures allow rapid and minimally invasive changes, favouring efficient and sustainable management of environments. Multipurpose spaces, such as waiting rooms that can be converted into training rooms or telemedicine venues, maximise efficiency and use of available resources.

Center for Cancer and Health, Denmark (2011)

Scalable Technologies

Concerning technology, scalable infrastructures and modular plant engineering systems ensure the continuous integration of new medical technologies, contributing to improve clinical and energy performance. In particular, for “low-medium care” areas, a minimum height of 4 meters is recommended, while in areas with high technological complexity, a height of at least 5 meters is required. A regular structural mesh of not less than 8x8 meters guarantees optimal adaptability of the spaces to future needs.
Such structural sizing, however, is only an optimal indication, and is not a minimum or mandatory requirement.

Adaptive Sustainability

Finally, design flexibility contributes to environmental sustainability. The adoption of prefabricated materials and efficient technologies reduces environmental impact and promotes a more responsible use of resources. This approach improves the experience of both patients and staff, offering humane and easily adaptable environments that promote psycho-physical well-being and optimise the perceived quality of care.

User personalisation and Design for All

EKH Children Hospital, Thailand (2019)

Hospital design must meet the physical, psychological and social needs of users, adopting an integrated approach that combines Universal Design, Inclusive Design and Design for All. These principles create accessible, usable and functional spaces for all categories of users, regardless of age, gender, or motor, cognitive and sensory abilities.

Specific differentiations

A central element is the differentiation of spaces according to the specific needs of different types of users. Separate entrances and routes for outpatients, staff and visitors are essential, minimising interference. For example, dedicated routes for stretcher patients, walking users and visitors ensure safety, efficiency and privacy.

Modularity

The modular design allows functional areas to be characterised flexibly, adapting them to the specific needs of users.
An analysis of the anthropometric characteristics of the different types of users guides ergonomic choices on materials, furnishings and finishes, improving the usability and comfort of spaces. This approach ensures that each user can carry out their activities safely and independently.

Universal accessibility

The adoption of Universal Design principles guarantees barrier-free environments. Ramps, suitable lifts and visual, tactile and acoustic signs facilitate orientation. Users with sensory or cognitive disabilities can navigate the spaces independently thanks to intuitive pictograms, colours and indications, improving spatial communication.

Adaptability of common areas

Difference extends to recreational and communal areas, which must be flexible to meet the needs of different categories of users. For example, waiting rooms with customisable layouts and diverse seating options can balance privacy and socialisation, improving psychological comfort and respecting individual preferences.

Sensory quality of space, Seattle Children's Hospital

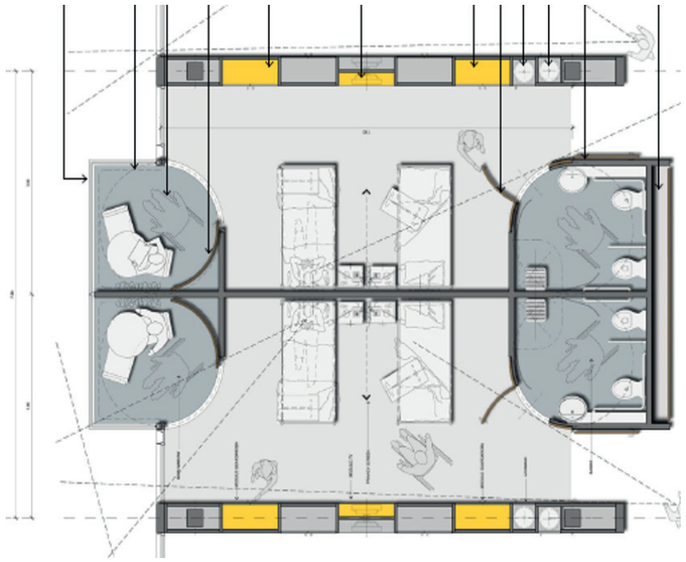
Privacy and safety

Safety and privacy are crucial. Inpatient rooms must ensure acoustic and visual privacy through partition walls and soundproofing systems. Clear and easily accessible evacuation routes ensure safety even in emergency situations, minimising risks for all users.

User participation

The User-Centered Design approach relies on the direct involvement of patients, caregivers and healthcare professionals in the design process. Their participation helps to develop solutions that effectively meet their needs, improving functional features and sense of belonging.

Single Rooms



Città della Salute, Milan

Aarau Cantonal Hospital, Aarau, Switzerland (2019)

Infection Control

Single rooms play a crucial role in controlling nosocomial infections. In a hospital setting, where the risk of infection is high, physical separation between patients limits the spread of pathogens. This configuration allows patients with contagious diseases to be isolated without impairing the operations of other units.

Personalised comfort

The private environment of the single rooms promotes physical and mental recovery. These rooms offer more control over the indoor microclimate, such as lighting and temperature, and include custom comfort technologies, such as entertainment systems and telemedicine, enhancing the patient experience.

Privacy and Interaction

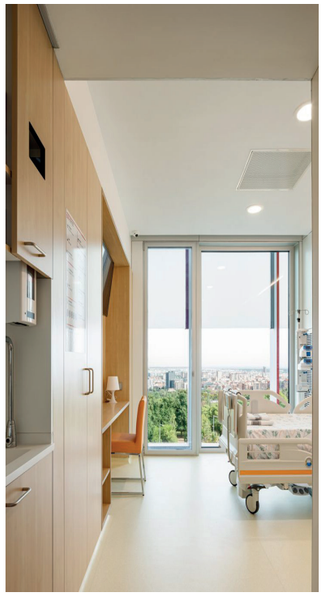
Single rooms provide greater privacy, allowing patients to receive visits and communicate with healthcare professionals in a protected environment. This provision improves the quality of doctor-patient communication and increases satisfaction, fostering a more confidential and personalised relationship.

Functional flexibility

Flexibility is a distinctive advantage of single rooms designed for double occupancy. They can be quickly adapted to accommodate additional equipment or converted into intensive isolation units during medical crises. This makes the hospital more resilient and ready to handle unpredictable scenarios.

Technological Integration

Single rooms must be integrated into an advanced technology management system. Digital tools such



San Joan de Dèu Hospital, Barcelona (2022)

as interactive panels enable continuous monitoring and efficient communication with healthcare professionals, improving the quality of care and optimising the management of hospital resources.

Family Units

Single rooms can include a second bed for a parent or caregiver. The integration of family housing units ensures constant support during critical phases, improving the well-being of the patient and family members.

Connection with the world outside

The design of single rooms must maximise the use of natural light. Large windows provide a visual connection with the outside, contributing to psychological well-being and reducing patient anxiety. Studies show that a view of green area accelerates recovery and improves mood.

Spatial optimisation

The distribution of furnishings and equipment in single rooms must be rational, ensuring functional and welcoming spaces. Particular attention should be paid to indoor circulation and lighting to create a comfortable and practical environment.

Healing Environments

377 Kinderspital Zürich, Switzerland (2024)

Psychophysical well-being

Contemporary hospital design is oriented towards models that focus on the psychophysical and social well-being of users, integrating concepts such as healing environment, welfare area and homelike atmosphere. These approaches aim to create environments that not only facilitate physical healing, but enhance the overall experience of patients, staff and caregivers. Studies show that careful spatial design can reduce stress and improve quality of life.

Natural elements

The integration of natural elements contributes to the definition of a Healing Hospital Environment. Therapeutic gardens, designed for different types of users, include safe paths, meditation areas and spaces for light physical activity, promoting psychophysical well-being. These spaces help reduce patient stress and provide staff with space for recovery during breaks. The view of the vegetation from inpatient rooms also speeds up recovery and reduces anxiety as evidenced in several Evidence-Based Design studies. In urban settings, winter gardens and bioclimatic greenhouses are viable alternatives.

Connective landscape

An evolution of green spaces is the concept of connective landscape, where the roofs of buildings are transformed into parks accessible to staff and the community. This solution creates a continuum between the hospital and the urban context, with therapeutic and social benefits, contributing to urban regeneration.

Welfare area

Care for the well-being of healthcare professionals is crucial to improving the quality of services. Dedicated spaces such as relaxation rooms, recharge rooms and quiet zones help reduce stress and increase productivity. These customisable environments promote physical and mental regeneration, improving overall performance.

Spaces for patients and family members

Ospedale Policlinico, Miilan

Patients and caregivers also benefit from welcoming, multifunctional spaces. Reading corners, co-working spaces and Wi-Fi enhance the experience, promoting an inclusive atmosphere. Modern hospitals offer environments for socialising, dining and physical activity, turning into holistic wellness hubs.

Homelike atmosphere

The homelike approach aims to reduce the perception of extraneousness in hospital environments. Flexible rooms accommodate caregivers and family members, while materials and furnishings combine aesthetics and functional features. Circadian lighting, which replicates the natural day-night cycle, improves patients' rest and psychological well-being.

Intergenerational spaces and staff well-being

Some hospitals include playrooms, children's play areas and gyms for staff, fostering a work-life balance. These elements create a more humane and welcoming environment, emphasising the importance of people-centred design.

Scientific evidence

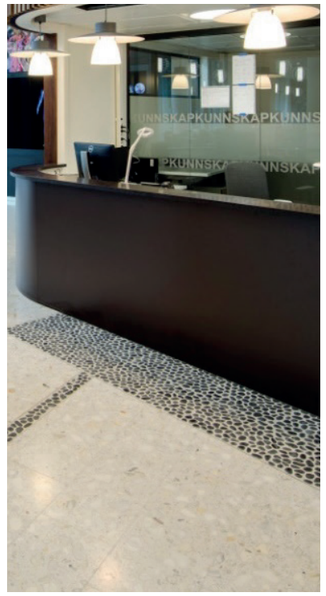
The integration of these design strategies is based on scientific evidence demonstrating how a wellness-oriented environment improves clinical outcomes, reduces hospitalisation time and increases user satisfaction. This approach transforms the hospital into a space of care and social gathering, where every design choice is guided by the central role of the person. The implementation of monitoring and the activation of pre- and post-occupancy evaluation studies contribute to transforming the design experience into a true experimental laboratory to identifythe Great Malpensa Hospital as a prototype of the Hospital of the Future.

Rabot Community Health Centre, Belgium (2021)

Sayanomoto Clinic, Saga, Japan (2014)

SJD Pediatric Cancer Center Barcelona, Spain (2022)

Wayfinding



St. Olav Hospital, Norway

Strategic orientation

A well-designed wayfinding system not only orients visitors but becomes a strategic element to improve operational efficiency and user experience. In a modern hospital, where speed and clarity of movement affect the quality of care, an effective guidance system reduces stress and improves service perception.

Urban integration

Wayfinding starts from the outside with clear identification of main entrances, parking lots and public transport links. The goal is to ensure easy access, integrating the hospital into the urban context. The visual consistency between exterior and interior reinforces the identity of the place, making orientation intuitive from the moment you access the hospital perimeter.

Universal accessibility

Inside, the system combines visual, audible and tactile signage to be accessible to users with different cognitive, linguistic or physical abilities. Interactive digital tools, such as information totems and mobile apps, provide personalised directions, improving accessibility and enabling routes optimised for specific needs, such as reduced mobility.

Technology for Efficiency

The adoption of beacons and RFID tags allows to monitor and optimise internal flows, improving resource management. These tools integrate with modular signage systems, which can be upgraded to quickly respond to changes in space or operating paths.

Architectural Orientation

Architecture itself can act as a natural guide. Elements such as corridors with exterior views, well-lit spaces and visible focal points facilitate orientation. Natural and artificial lighting plays a crucial role, creating a clear and welcoming environment.

User feedback

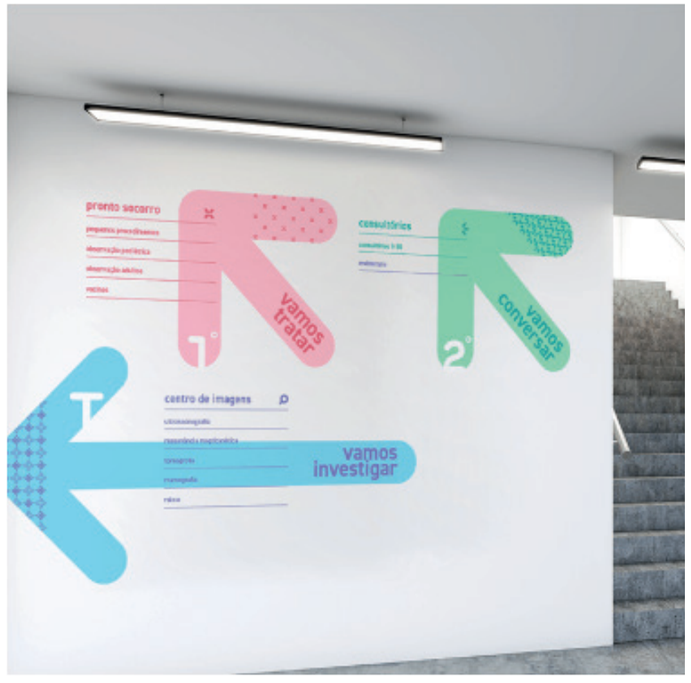
Involving users in designing wayfinding ensures that the system effectively meets their needs. The collection of feedback through simulations or pilot tests allows you to identify critical issues and make evidence-based improvements, following the principles of Evidence-Based Design.

System Adaptability

Flexible wayfinding is essential in a dynamic hospital environment. Frequent changes in spatial configurations require an easily upgradeable system. Modular signage and digital solutions allow rapid changes, ensuring business continuity and effectiveness.

Continuous maintenance

Regular maintenance is crucial to ensure effective wayfinding. Worn signs or broken displays may cause disorientation. A dedicated management plan must include continuous monitoring and timely intervention to keep the system operational.



Example of Wayfinding implementation

Environmental sustainability

Meyer Children's Hospital, Florence

Energy efficiency

Sustainability is a fundamental pillar in modern hospital design with particular focus on energy efficiency and on reducing environmental impact. Hospital buildings aim to minimize energy consumption through the use of passive and bioclimatic systems, such as bioclimatic lobbies and photovoltaic façades, which not only filter natural light to reduce energy needs, but also generate renewable energy on site. Efficiency is further enhanced by high performance building envelopes using double or triple glazed façades and active shading systems to ensure thermal and visual comfort.

Proactive Resource Management

The adoption of advanced technologies such as the Building Energy Management System (BEMS) and the digital twin allows constant monitoring and predictive management of resources. These tools optimise energy and water consumption, improving operational efficiency and reducing carbon emissions. The ability to predict future needs and prevent inefficiencies is a competitive advantage for modern hospitals, in line with international guidelines.

Innovative Plant Engineering Solutions

The integration of state-of-the-art systems for sustainable energy management, such as geothermal heat pumps, cogeneration systems, energy recovery and photovoltaic systems must ensure that the share of energy produced from renewable sources is maximised. These solutions include variable flow systems that adapt to space occupancy, optimising the use of resources and ensuring high operational efficiency

Sustainable mobility

The project includes modal interchange hubs with charging stations for electric vehicles, bicycle parking and spaces for micro mobility. These interventions, together with the connection with urban cycling routes and local ecological networks, promote sustainable and inclusive

mobility, reducing emissions associated with travel.

Ecological Continuity and Landscape

The landscape project strengthens ecological continuity, connecting the hospital to the Ticino Valley Regional Park and the Olona ecological system. Green spaces, such as the Bosco della Salute and Corti Boscate, not only improve the psychophysical well-being of users, but also promote biodiversity and reduce the need for intensive maintenance through the use of native species.

Circular Design

The circular design strategy involves the use of regenerative and recycled materials, supported by a materials passport that traces the origin and future recycling of building elements. This practice not only reduces waste, but promotes a sustainable life cycle for the entire hospital facility.

Social and Environmental Integration

The hospital positions itself as a resilient infrastructure and benchmark for sustainability, responding to both environmental and social challenges. The combination of sustainable strategies and innovative solutions helps create an environment that supports the well-being of the community, aligning with the global sustainability goals.

Children's Hospice, Bologna (2023)

Technology and digitisation

Pneumatic mail system

Advanced Integration

The New Hospital will be an example of advanced integration between technology, digitization and intelligent systems, with the aim of ensuring operational efficiency, safety and long-term sustainability. The adoption of innovative solutions will improve the patient experience, optimise clinical processes and promote infrastructural resilience.

Monitoring and Simulation

Key technologies include the Building Energy Management System (BEMS) and the digital twin. The BEMS allows real time monitoring of energy and water consumption, reducing waste and optimising resources. The digital twin, on the other hand, virtually replicates the hospital, allowing operational simulations, predictive maintenance and strategic decision support. This technology improves adaptability of the structure to future needs.

In addition to detection and monitoring systems, it is necessary to identify an area dedicated to Command Centre activities. These activities are increasingly central in the design of contemporary hospitals, allowing to monitor environmental parameters related to the building, plant engineering components, clinical processes and patients managed remotely.

Automated logistics

Digitization will extend to internal handling and logistics systems. The adoption of Automated Guided Vehicles (AGVs) will ensure automated and safe transportation of materials, while a pneumatic mail system will connect key areas such as laboratories and pharmacies. For external transport, the hospital will have a drone station for the rapid transfer of critical materials such as blood and blood components.

Automated Pharmacies

Pharmaceutical management will be digitised with automated pharmacies for expiration control and inventory optimisation. These

AGV system for handling loads

systems will reduce waste and increase patient safety, ensuring a continuous and monitored flow of medicines.

Telemedicine and Data Access

Telemedicine is a pillar of digitisation with platforms that will allow patients to access remote medical advice, improving access to treatment and reducing travel. Electronic information systems will ensure unified and secure management of clinical data, improving communication between departments and information traceability.

It is necessary to provide spaces dedicated to telemedicine and televisiting activities, and to ensure the future conversion of current outpatient environments into environments suitable for remote consultation activities.

Sensory Room

Advanced Security

Concerning safety, technologies such as facial recognition and motion sensors can be implemented to monitor the environment in real time. These systems will provide high protection for patients and staff.

Intelligent Comfort

Intelligent lighting and air conditioning systems will ensure optimal environmental comfort, automatically adjusting conditions according to the presence of people and the specific needs of each department. This approach improves the patient experience and contributes to overall energy efficiency.

Remote Monitoring

The use of intelligent medical devices and remote monitoring systems will allow constant monitoring of patients' vital signs, both in hospital and at home. This approach personalises care, optimises the use of resources, and improves emergency management.

Scalable IT Infrastructure

The IT infrastructure will be designed to ensure interoperability and cybersecurity.
This scalable architecture will support the evolution of technologies, keeping the hospital structure abreast of innovations and protecting sensitive data.

Innovation and Sustainability

The adoption of these technologies positions the hospital as a benchmark for quality of care and sustainable innovation, consolidating its role in the global healthcare landscape also by introducing control (command centre) and research spaces.

Monitoring and evaluation

Command Centre, SJD Barcelona, Spain (2022)

Monitoring and evaluation are crucial elements to ensure that the New Hospital meets the expected quality and operational standards. The implementation of advanced assessment and post-occupancy evaluation (POE) tools allows systematic analysis of the quality and effectiveness of interventions. These tools not only provide essential data for performance verification, but also support real time decision-making and improvement actions.

Post Occupancy Evaluation (POE)

The POE allows to collect concrete data on space usage and user satisfaction. This tool identifies operational criticalities and suggests corrective actions, ensuring continuous adaptation of the structure to the needs of patients and staff. The goal is to maintain a high quality standard and to ensure that the hospital remains functional even in changing operational contexts.

Key Performance Indicators (KPIs)

The use of Key Performance Indicators based on Evidence-Based and Practice-Based approaches is essential. These indicators combine scientific evidence with field observations to assess the impact of design and operational choices. Solid data collection allows you to monitor specific aspects such as energy efficiency, accessibility and spatial comfort.

Services and Continuous Feedback

Monitoring activities include regular surveys of patients and healthcare professionals to measure satisfaction. These surveys collect feedback on specific environmental elements, such as lighting quality, air conditioning and accessibility, providing insights to improve the hospital experience. In addition, this data is integrated with digital systems analytics for a complete picture of performance.

Sustainability Assessment Tool - Design and Health LAB

Digital Systems for Monitoring

Advanced tools such as the Building Energy Management System (BEMS) and the Digital Twin play a key role in monitoring performance. These systems analyse energy consumption, space usage and plant performance in real time, allowing proactive and optimised asset management. The Digital Twin, in particular, simulates operational scenarios and supports predictive maintenance, reducing downtime and optimising resources.

Focus on User Well-being

In addition to the technical aspects, monitoring aims to improve the overall well-being of users. The data collected allows targeted interventions to be implemented, such as optimising air conditioning and lighting, to offer a comfortable and welcoming environment. These improvements contribute to a better quality of the hospital experience for both patients and staff.

4

Design Levels and Required Documents

The chapter summarises the project levels identified in accordance with current legislation. In addition, the contents and formats of the minimum graphic, technical and design documents required by the call for tenders are detailed and specified.

4.1
Design levels

The sequence of project levels to be developed for the construction of the New Hospital of Busto Arsizio and Gallarate pursuant to Article 41 of Legislative Decree 36/2023 is introduced by the definition of the Technical and Economic Feasibility Project pursuant to Section II, Articles 36/2023. 6 to 19 of Annex 1.7. In particular, this public works design phase shall ensure:

a) that community needs are met;

b) compliance with environmental, urban planning and cultural and landscape heritage protection standards, as well as compliance with the provisions of legislation on the protection of the health and safety of buildings;

c) compliance with architectural and technical-functional quality requirements, as well as compliance with the expected time and costs;

(d) compliance with all existing constraints, with particular regard to hydrogeological, seismic, archaeological and forestry constraints;

e) energy efficiency and minimisation of the use of non-renewable material resources throughout the life cycle of the works;

f) respect for the principles of economic, territorial, environmental and social sustainability of the intervention, also to counteract soil consumption, encouraging the recovery, reuse and enhancement of existing building stock and urban fabrics;

(g) rationalisation of design activities and related verifications through the progressive use of digital information management methods and tools for construction referred to in Article 43;

(h) accessibility and adaptability in accordance with current provisions on architectural barriers;

i) the geological and geomorphological compatibility of the work.

Please refer to the specifications for the use of digital information management methods and

4.2
Required documents

The development of the Technical and Economic Feasibility Project (PFTE) will be structured in two different phases, linked to the timing of the tender procedure (please refer to the call for tenders):

A. **Competition phase**
B. **Finalisation of the PFTE** (with an intermediate step for the approval of distribution layouts, as per the contract outline attached to the documentation of this competition)

A. Competition phase

The Contracting Authority, in the competition phase, asks the subjects admitted to the project submission phase to develop the project idea illustrated in the following works:

Explanatory and technical report for a maximum of 3,500 characters per page, including spaces, in UNI A4 format on PDF file, oriented vertically, for a total of 20 (twenty) façades that illustrates the guiding criteria, also through schematics and images, of the design choices in relation to the objectives set out in the Call and the characteristics of the intervention desired by the DIP;

Urban insertion report for a maximum of 3,500 characters per page, including spaces, in UNI A4 format on PDF file, oriented vertically, for a total of 10 (ten) façades that illustrate the guiding criteria, also through schematics and images, of the design choices in relation to the constraints identified at the SEA and summarised in the dedicated

chapter of the DIP.
Graphic documents; 8 (eight) tables in UNI A0 format on PDF files, oriented horizontally, illustrating the project idea and containing at least the following elements:

- plan of insertion of the intervention at a scale of not less than 1:2000, accompanied by profiles (schematic sections), which allows to evaluate the relationships of the New Hospital and its area of relevance with the surrounding context and road network;
- plan of the project area including the hospital building and the area of relevance used for ancillary functions, at a scale of not less than 1:1000, with a definition of the road network (access flows and indoor-outdoor-emergency-logistics routes);
- 3D representations of insertion of the work from a territorial, urban and landscape point of view;
- significant plans, elevations and sections at a scale of not less than 1:500, with the functional distribution and flow pattern (exterior, interior, goods);
- any other illustrative technical work deemed suitable for making the morphological, typological, structural and technological aspects understood that enlighten the architectural, design and monitoring solutions adopted.

Summary calculation of expenditure and economic project framework contained in a dossier of up to 20 (twenty) pages in UNI A4 format on PDF file. The table in Chapter 6 “Financial Plan and Economic Framework” of this document shall be completed and attached.
The conditions are explained in the call for tenders.

B. PFTE Refinement

The winner of the competition will be entrusted with the task of integrating the competition papers in order to reach the level of depth of a technical and economic feasibility project.
The Technical and Economic Feasibility Project (PFTE), drawn up and developed with BIM technology, must contain a time schedule relating to the entire construction process of the work in accordance with the terms indicated in the financing provision.
The winner of the competition, in the development and completion phase of the PFTE, undertakes to:

- take into account the requirements, ***recommendations and constraints defined in the Framework Programme Agreements (FPAs) and SEA***;
- take into account ***any recommendations, comments and indications made by the selection board,*** at the end of the competition;
- take into account ***any requests for distributional-functional*** layout changes, which do not alter the overall nature of the assignment, by Valle Olona LHA;
- take into account ***possible proposals for improvements***, which do not alter the overall nature of the assignment, by the Contracting Authority;
- **support the Contracting Authority in technical meetings with the entities responsible for issuing authorisations,** as well as in preparing drafts for the presentation of the project to the aforementioned entities in the event of a preliminary service conference;
- **bear the costs and expenses of reproducing the requested works** for the purpose of completing the PFTE.

The Contracting Authority reserves the right to request submission of an intermediate delivery of the project documents during which to define the progress of the PFTE completion activities and acquire the prior approval on distribution layouts by Valle Olona LHA.

In order to ensure a constant comparison with the Contracting Authority during the activities to complete the technical and economic feasibility project, the winner undertakes to participate in all the meetings convened by the Sole Project Manager (RUP) during the completion phase of the project itself, and to carry out all surveys and cognitive studies (morphology, geology, geotechnical, hydrology, hydraulics, seismic, ecosystem units, historical evolution, land use, urban destinations, landscape, architectural, historical-cultural values, preventive archaeology, regulatory constraints, etc.).
The PFTE takes into account, as far as possible, the orographic and morphological characteristics of the physical context of intervention, limiting changes in the natural course of the land (and consequently soil consumption and earth movements), while also safeguarding the hydraulic unofficial nature of watercourses (natural and artificial) interfered by the work, the hydrogeology of the subsoil and the geotechnical stability of the surrounding natural reliefs and artificial surveys.

In drafting the PFTE particular attention shall be paid to:
a) ecological compatibility of the design proposal, favouring the use of techniques and materials, elements and components with low environmental impact;
b) adoption of measures that, in harmony with the project proposal,

promote the protection and enhancement of cultural heritage, contributing to preserving the memory of the national community and its territory, and promoting cultural heritage as an driver of economic development;
c) adoption of bioclimatic design principles and "passive systems" that allow to improve the energy balance of the building, with a view to an overall sustainability of the intervention itself;
d) useful reuse of excavation materials (in the quality of by-products and/or for naturalistic engineering interventions), minimising landfilling;
e) assessment of overall life cycle costs, including end-of-life costs;
f) inspectability and maintainability of the work, including using the methods and tools of digital information management of constructions referred to in Article 43 of the Code;
g) adoption of the best guidelines for the processes and methods of transport and storage of goods, capital goods and personnel, functional to the start-up, construction and maintenance phases of the work, favouring certified models, processes and organisations.

The PFTE, in relation to the size, type and category of the intervention is, in general, unless otherwise stated by the Sole Project manager (RUP) in the DIP, composed of the following works:
(a) general report;
(b) technical report, accompanied by surveys, investigations and specialist studies;
c) report of prior verification of archaeological interest (Article 28, paragraph 4, of the Code of Cultural Heritage and Landscape referred to in Legislative Decree no. 42, and any direct field surveys, including digitally supported;
d) environmental impact study for works subject to Environmental Impact Assessment (VIA);
e) sustainability report of the work;
f) plano-altimetric surveys and state of consistency of existing works and those interfering in the immediate surroundings of the work to be designed;
g) information templates and related specialist report, in the cases provided for in Article 43 of the Code;
h) graphic drawings of the works, in the appropriate scales, integrated and consistent with the contents of the information models, when present;
i) estimating the work;
l) economic project framework;
(**m)** an economic and financial plan in principle for works to be carried out by public-private partnership;
n) time schedule;
o) safety and coordination plan, aimed at protecting the health and safety of workers on construction sites, pursuant to Legislative Decree no. 81, as well as in application of existing trade union agreements on the subject. Estimation of security costs. The security and coordination plan may be supported by information models;
p) specifications in the cases provided for in Article 43 of the Code. The information specifications will contain the specifications relating to the equivalence of the information content present in the documents with respect to the levels of information requirements required for the information models;
(q) preliminary maintenance plan for the work and its parts. The maintenance plan can be supported by information templates;
(**r)** preliminary geotechnical and structural monitoring plan;
s) for works subject to the Environmental Impact Assessment (VIA), and in any case where required, preliminary environmental monitoring plan;
(**t)** Particle plan of expropriated or to be acquired areas, where relevant.

The completion of the PFTE must contain all the documents necessary to obtain opinions, permits and authorisation to carry out the work.

5

Constraints and Requirements

The chapter details all urban, territorial and strategic constraints and requirements required to define the parameters within which the project proposal can be developed. The indications are a reasoned summary of the instances provided for in the SEA and Programme Agreement referred to for further details or clarifications.

Constraints and Requirements

The following are the design recommendations, including in relation to current town, country and landscape planning and strategic environmental assessments (VAS), where relevant, supplementary technical procedures or specific technical standards that are intended to be the basis of the intervention design.
For the definition of all parameters, such as Territorial Area, Indoor Area, Territorial Index, Parking lots, Filter Green, Planted Green, please refer to the contents of the PGT of the Municipality of Busto Arsizio.

Territorial manufacturability

The land area covered by the interventions planned for the construction of the Great Malpensa Hospital is 167,996 sq.m.
The design content of the proposal refers to the following parameters:

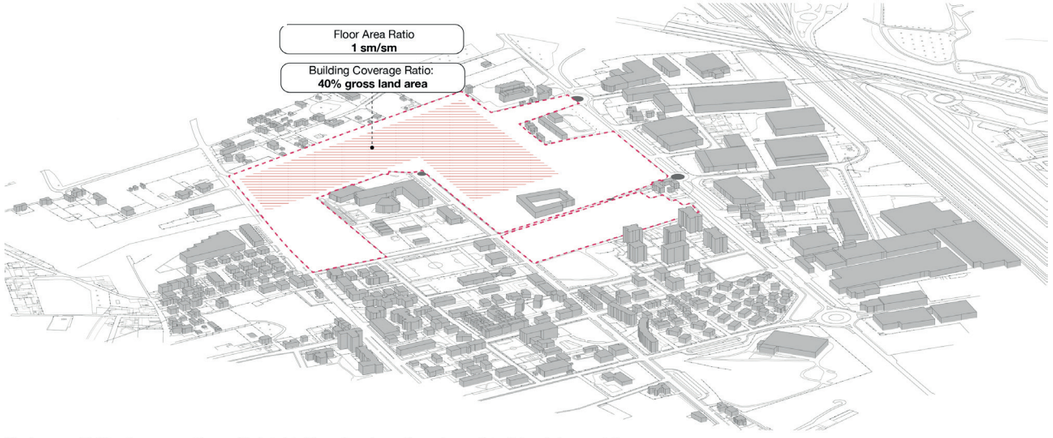
- Territorial Area (ST) of the area of 167,996 sq.m;
- Maximum indoor area 40% ST;
- Territorial manufacture Index 1 sq.m/m.

The New Volumes

The total area of the new building volumes for sanitary and ancillary functions is estimated at about 110,000 sq.m divided into:

- 90,000 sq.m for hospital functions including the Executive, Administrative and Logistic areas.

BUILDABLE LAND CAPACITY



The shapes and their location represent the possible size of the surfaces in question, and are not intended as design requirements.

• 20,000 sq.m for the Technical and power centre areas.

The structures will inevitably exceed in elevation the limit set by the Territorial Coordination Plan (PTC) of the Ticino Park (8 m), so, as also reported in the chapter on design requirements, proposals must be integrated with the landscape context and the buildings must envisage a predominantly horizontal development.

Access to the Area and Infrastructural Works

Project proposals will have to take into account the two existing access points:

- Roundabout at intersection Via S. Gottardo – SS33
- Roundabout at intersection Via Cascina dei Poveri – SS33
- The design must envisage the following infrastructural works;
- Access to the area through a newly built roundabout, to be located at the intersection of Viale Milano and Via Quintino Sella;
- Adequate driveway connection between SS33 and Via Quintino Sella.

Infrastructural works envisaged when planning municipal administrations

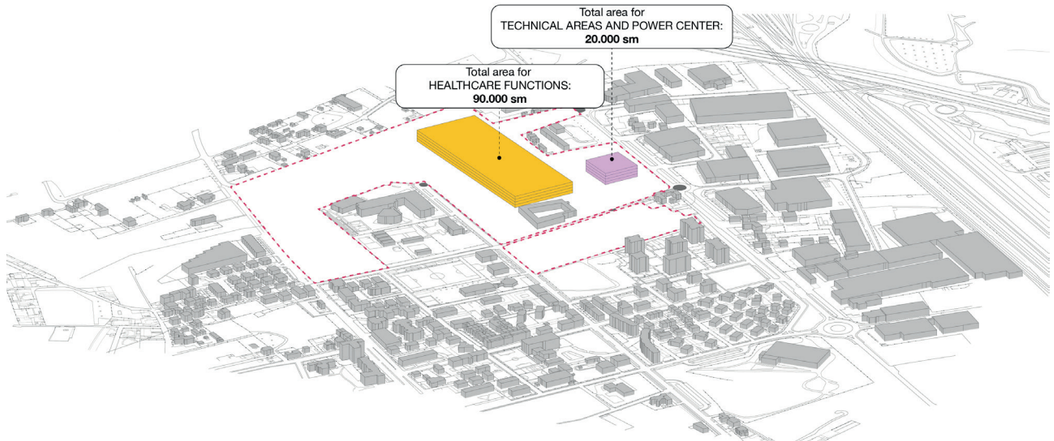
The schedule of the Municipalities of Busto Arsizio and Gallarate envisage the following infrastructural works outside the scope of the Agreement. They are co-financed with the fund established pursuant to Law no. 9/2020 (Regional Council Decree no. 6047 of 1/3/2022), also functional to improve accessibility to the New Hospital:

- Road connection in S. Anna with railway underpass in the Municipality of Busto Arsizio;
- Roundabout at the intersection of Viale Milano (SS. 33) and via Adige in the Municipality of Gallarate;

As part of the VAS procedure of the Programme Agreement, infrastructural works to support the accessibility of the New Hospital are identified. The works planned/to be planned within the programming of the respective Municipal Administrations are:

- Redevelopment of SS33 - Route A in the municipality of Busto Arsizio;
- Roundabout upgrade via Cascina dei Poveri in the Municipality of Busto Arsizio;
- Redevelopment of Via Sella in the Municipality of Busto Arsizio;
- New roundabout at the intersection of via Cascina dei Poveri and via Sella in the Municipality of Busto Arsizio;
- Adaptation of via dei Platani/via delle Querce in the Municipality of Gallarate;
- Redevelopment of SS33 - Route B in the municipality of Busto Arsizio;
- Extension of Via Filzi in the Municipality of Gallarate (L.=

NEW BUILDINGS



The shapes and their location represent the possible size of the surfaces in question, and are not intended as design requirements.

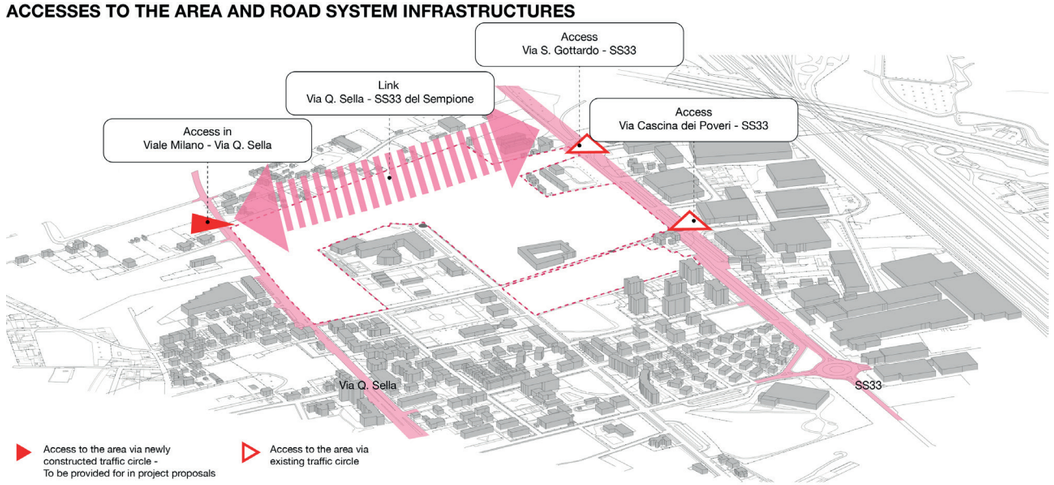
320 m);
- Redevelopment of Via Filzi in the Municipality of Gallarate (L.= 650 m);
- Adaptation stretch via Sicily to via Calatafimi in the Municipality of Gallarate (L=600 m).

The road works listed, once the procedures have been explained and the necessary opinions have been obtained, must be carried out by the Municipality of Busto Arsizio and the Municipality of Gallarate, in accordance with the schedule.
For comments and contributions from the VAS Regional Technical Unit, please refer to Annex 6 to the Programme Agreement.

Parking and parking areas

Over 45,000 sq.m of parking spaces for a total of 1,502 parking spaces. For parking spaces for employees (sized for about 667 cars), dedicated spaces for the public (667 parking spaces) 38 spaces dedicated to First Aid and 130 parking spaces for those with disabilities. Parking spaces for staff must be located in a detached area separate from that intended for external users. Regarding the parking facilities, it should be noted that, although the reduced solution ensures the number of parking spaces required by law as indicated by the regulations, the minimum number will be set at the current number of parking spaces available at the two facilities, namely 1,500 parking spaces, equivalent

ACCESSES TO THE AREA AND ROAD SYSTEM INFRASTRUCTURES



The shapes and their location represent the possible size of the surfaces in question, and are not intended as design requirements.

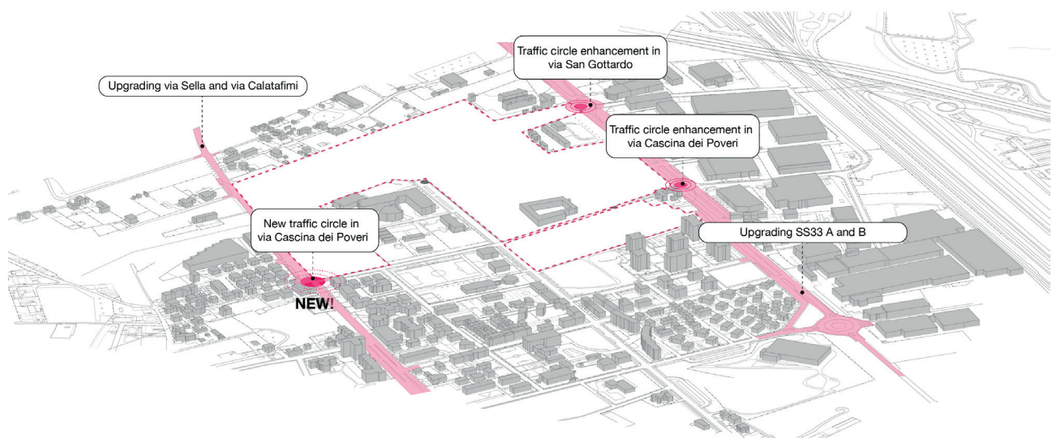
to the total currently serving the two hospital sites. Electric vehicle parking spaces must also be provided, including charging infrastructure (e.g., charging columns) and spaces dedicated to sustainable mobility, on reserved spaces for bicycles and motorcycles, equipped with adequate protection, safety and, where possible, charging points for two-wheeled electric vehicles. Design proposals should include an area for future parking expansion, appropriately sized and positioned in line with the overall project organisation. This area must be identified and clearly represented in the required graphic drawings, with an indication of the potential ways of use and functional integration with the existing parking system.

Green areas

As defined by the Programme Agreement (pursuant to art. 7 of Regional Law No. 19 of 29 November 2019 and Article 34 of Legislative Decree No. 267 of 18 August 2000), it is repeated that the Great Malpensa Hospital of will be characterised as a "Green Hospital" and "Hospital in the green" offering patients, employees and visitors large courtyards with trees and shrubs and paths for the use of vegetation. Around the new structure is planned The construction of a perimeter woodland of over 30,000 sq.m and vegetation equipped with trees, shrubs is planned around the new facility, with fruition paths of 52,000 sq.m.

INFRASTRUCTURE WORKS PLANNED BY THE MUNICIPAL GOVERNMENTS

Infrastructural upgrading and renewal works planned around the project area as part of the planning of the respective municipal governments.



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In the courtyards, roads, and parking areas, 15% of the total area should be dedicated to green spaces, including trees, shrubs, and grass-covered parking lots. Appropriate green courtyards will be built within the structure. There is a roof covering with the possible presence of trees and shrubs.

In addition, the design of green areas must comply with the following dimensional indications:

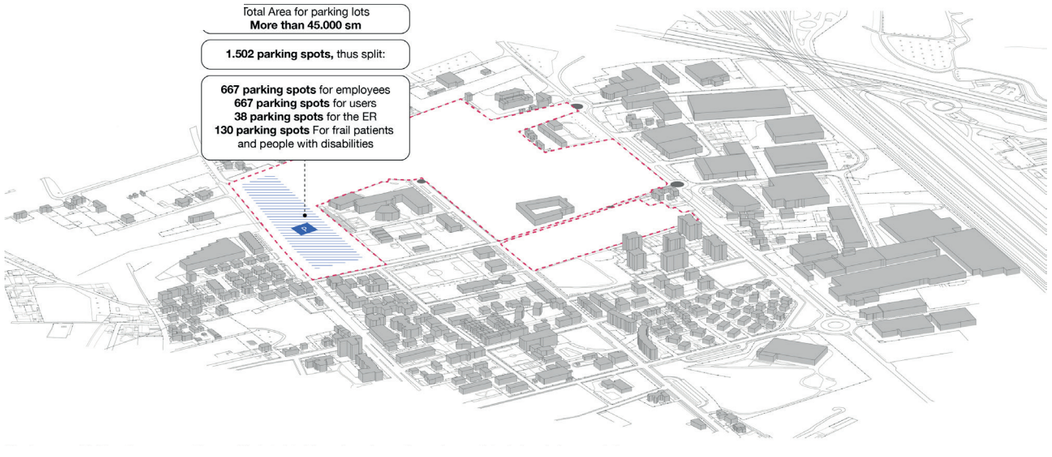
- Filter Green: minimum 30% ST;
- Planted Green: minimum 1/3 of the filter Green.

Relationship with existing structures

The design must also ensure that the health structure and the external areas serving it do not alter the current and consolidated perceptual relationships between the "Cascina dei Poveri" and the surrounding landscape with actions that ensure the integration of the asset into the project under consideration, favouring its conservation.

The Masterplans of the project proposals must, therefore, include the involvement of the building within the organisational and functional structure of the New Hospital, while at the same time highlighting the high cultural, historical and social values of the ancient agricultural settlement.

PARKING LOTS



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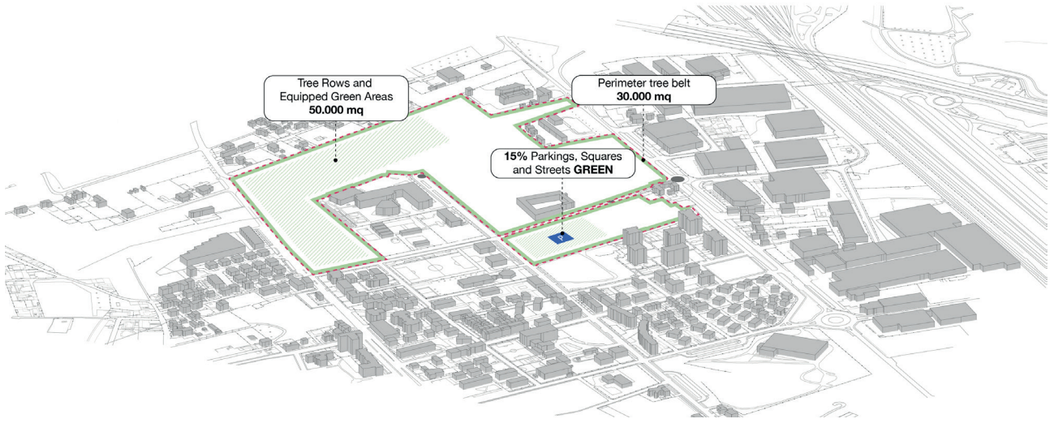
GREEN AREAS



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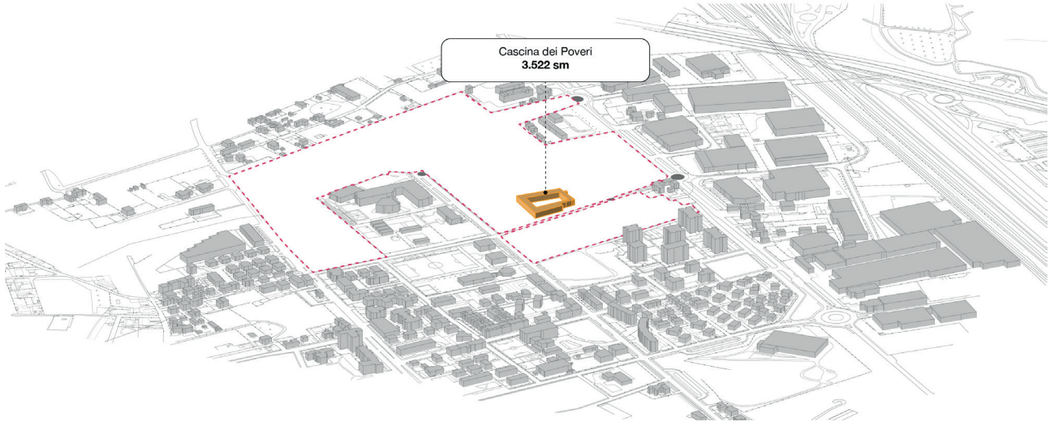
PRE-EXISTING BUILDINGS IN THE AREA



The design must also ensure that the healthcare facility and the external areas serving it do not alter the current and consolidated perceptual relationships between the "Cascina dei Poveri" and the surrounding landscape with actions that ensure integration of the asset into the scope of the project under consideration, favouring its conservation.

6

Financial Plan and Economic Framework

The chapter highlights the economic and financial constraints, the sources of financing and the general economic framework of the intervention to allow a realistic and informed design from the earliest assumptions of development.

The construction of the New Hospital of Busto Arsizio-Gallarate in the area in Beata Giuliana is based on a capacity of 773 beds including ordinary, day hospital, day surgery, intensive care and technical beds, capacity determined by the Valle Olona LHA (Feasibility Study June 2024). On the basis of these data, health, administrative and logistic macro areas have been dimensioned; parking and road spaces and green areas have also been identified.

The total area assigned to the New Hospital in the municipality of Busto Arsizio, called "Beata Giuliana", is about 167,000 sq.m.

DEFINITIVE SETTING:
The following is a summary of the main numerical parameters:

- Total Beds No. 773;
- Multi-storey car parks covered with hanging vegetation for both Staff and Public with a minimum of 1,500 parking spaces (data > 40% spl minimum requirements of DGR 38133);
- Estimated total cost works: € 291.905.000,00;
- Value Building Box + Multi-storey parking + Outdoor Areas + Available amounts (excluding Furniture and Medical and ICT Technologies) total **401,116,160.00 Euro**
- **Total value (including Furniture) 440,000,000.00 Euro**

The essential elements of the dimensional and economic structure developed for the New Hospital of Busto Arsizio – Gallarate, are the following:

- Total area of the Hospital: 140 sq.m./bed of ordinary inpatient + DH and DS (n°773 total Beds of technical PL) figure aligned with the benchmarks, illustrated below;
- Multi-storey car parks: for Personnel and Public, both built with semi-underground multi-storey structures covered with "hanging green", in the measure of 1,500 parking spaces (data above the minimum standard set out in Regional Council Decree 38133 which provides, for the parking area, to allocate 40% of the SLP;
- Green areas: economic parameters are aligned with benchmarks;
- Furniture: the economic parameters refer to the furnishing of ordinary inpatients and are aligned with the benchmarks of reference;
- Medical and ICT technologies: a quota of medical technologies has been calculated to complete the share of furniture and equipment to cover more than 15% of the amount of ministerial funding;
- Among the sums available: The value of the resolution of any interference is included in the item "unforeseen" valued as equal to 5% of the total value of the Works.

The enhancement of the Works and Furniture related to the construction of the New Hospital of Busto Arsizio – Gallarate must be developed according to the principles and parameters that follow:

1. Reference to Institutional Guidelines of national importance relating to the cost of building and equipping Hospitals;
2. Reference to Price Lists for Public Works in recent updates.

The amount of works to be planned is €291,905,000.00, including safety charges, as deduced from the DOCFAP hypothesis. Compliance with this amount and with the provisions of the Technical and Economic Framework is to be considered binding as a maximum limit linked to the relative financial coverage.

The estimate of the cost of the work was defined according to economic and financial resources, programming requirements and the following bibliographic sources: The contribution to the research 263/2018 "Hospitals, Theoretical Costs of Construction and Maintenance 2017" published by IRES Piemonte, reported the results of comparative assessments for the metric estimation calculation, defining the costs per square meter for areas intended for medical use and not, also qualified, for different types of functional areas. **On this starting point, the individual costs are indexed, increasing them according to the changes in the synthetic ISTAT index of construction costs in analogy to the methodology of art.60 Legislative Decree 36/2023.**

To these are added, in this hypothesis, the costs for the **20,000 sq.m of the technology centre, plant engineering distribution and additional technical rooms, for about € 25,000,000.00 total.**

As highlighted, this average value refers only to the hospital "Building Box", including Technology Hub, and does not include the following additional cost items:

- Multi-storey and "level" parking lots distributed on the perimeter of the Hospital to serve the "frailty" (Dialysis, Radiotherapy etc.)
- Roads within the perimeter of the Hospital
- Outdoor green areas and accommodation, fences etc.

The hypothesis studied in the DOCFAP, established project surfaces:
It should be noted that the feasibility solution for the Staff Parking and the Public Parking, in line with the indications emerged within the Technical Secretariat of the AdP also concerning the landscape contiguity with the historic building called "Cascina dei Poveri", provides for the construction of two semi-underground multi-storey facilities covered with hanging vegetation.

The competition may include revisiting the surfaces, relating to each submitted proposal; however the total cost must not exceed the financial resources of the work. In the tender document "Summary calculation of expenditure and economic framework of the project", the competitor must complete the following table to prove the verification made on the feasibility of the individual proposal.

The Ministry of Health has evidenced that it is necessary to prepare the project of the New Hospital Busto Arsizio Gallarate, and asked to make the financial schedule of the New Hospital consistent with the annual endowments provided for in the decree (from 2020 to 2034), whose details are given below.

ART.1 LAW 160 OF 27 DECEMBER 2019 PARAGRAPH 14 Considering art.1 Law 160 of 27 December 2019 paragraph 14 – Fund for the release of investments of the central government of the State for the development of the country, for a sum equal to €102,955,573.64 available to the Lombardy Region of which € 37,776,350.84 - “sums to be allocated to the financing of health-related construction works” management plan 4 and € 65,179,222.80 - "sums to be allocated to the financing of environmental sustainability and energy efficiency interventions" management plan 5. The Ministry of Health with prot. note 15708 of 29/07/2022 asked the Lombardy Region to identify the needs broken down by management plan.
Lombardy Region with prot. note MdS no. 17447 of 1/09/2022 identified for both management plans the New Hospital of Busto Arsizio and Gallarate. The General Administration of Health Programming – Office 7 – with prot. note 0021033 of 20/10/2022 highlighted that it is necessary to prepare the project of the New Busto Arsizio and Gallarate Hospital clearly stating the portion that will be constructed with management plan 4 and the portion that will be constructed with management plan 5, accompanied by the financial schedule in relation to the annual allocations provided for in the decree (from 2020 to 2034).
The works related to the construction of the “Day Hospital”, which accounts for 13.1% of the medical area, or 11,700 sq.m, for works amount of 29,250,000.00 € plus VAT and technical expenses, corresponding to the amount financed, will be recompressed in Management Plan 4.
For the resources that will become available after works are tested and the structure is activated, approximately from 2031 to 2034, the shares will be invested in the technological modernisation of the areas of the “Day Hospital” to purchase equipment and furnishings recovered from existing structures. It is guaranteed that the intervention will be functional and operational at the time of testing the New Hospital of Busto Arsizio and Gallarate.
During the design phase, the designers will be asked to develop the day hospital in order to make the works easily identifiable and accountable for ministerial indications.

		Estimated surface area (sq.m)
1	Semi-underground multi-storey car parks covered with hanging vegetation	40,000.00
2	Street level parking for "frail" persons	5,000.00.
3	Streets, squares	34,000.00.
4	Equipped vegetation, urban park	52,000.00.
5	Perimeter woodland belt	30,000.00.
6	Works with “hanging” vegetation	25,000.00
7	"Short interior" vegetation works	5,000.00

Estimated area of outdoor areas

		ESTIMATED SURFACE AREA (SQ.M)	COST (€/SQ.M).
1	Services and critical area departments		
2	Services and non-critical area departments		
3	Reception, general distribution and connection areas		
4	General Services		
5	Logistic Services		
6	Plant engineering station and technological areas		
7	Semi-underground car parks covered with hanging vegetation		
8	Street level parking, streets, forecourts, etc.		

Example of a table for parametric quantification based on the estimated area for each area or type of intervention

SOURCES OF FINANCING FOR THE INTERVENTION

SOURCE OF FINANCING	AMOUNT	PROCEEDINGS - from HIRING/EMPLOYED	CONSTRAINTS
STATUS: art. 1 paragraph 14 Law no. 160 of 27/12/2019 - Prime Minister's Decree 23/12/2020	102,955,573.64.	A dedicated Agreement shall be signed between Ministry of Health and	With a note dated 20/10/2022, the MdS highlighted that it is necessary to prepare the project of the New Busto Arsizio Gallarate Hospital clearly stating the portion that will be constructed with management plan 4 (healthcare edition) and the portion that will be constructed with management plan 5 (environment and energy efficiency). They asked to make the financial chronology of the New Hospital consistent with the annual endowments provided for in the decree (from 2020 to
	of which:	€ 37,776,350.84.	-which "sums to be allocated to the financing of health-related construction works" management plan 4 and
	of which:	€ 65,179,222.80.	-"sums to be allocated to the financing of environmental sustainability and energy efficiency interventions" management plan 5.
STATUS: art. 20; Law 67/88 - resources referred to in Art. 1 - paragraph 263 - of Italian Law 30/12/2021, no. 234 - Ministry of Health Decree of 20/07/2022	€ 320,192,205.00	Supplementary AdP pursuant to art. 5 bis of Legislative Decree 502/92, as introduced by Legislative Decree no. 229/99	Regional Council Decree resources no. XII/2478 of 03/06/2024 – Investment programme art. 20 Law 67/88 – Framework Programme Agreement for the health investment sector referred to in Regional Council Decree No. xi/5835/2021.
REGION (5%)	€16,852,221.36		
TOTAL INTERVENTION	440,000,000.00.		

Sources of funding for the New Busto Arsizio-Gallarate Hospital

The two management plans cannot be overlapped, and there is no double funding with PNRR resources and art. 20; Law 67/88.

financial programme in relation to the annual allocations provided for in the decree (from 2020 to 2034).

The works related to the construction of the "Day Hospital", which accounts for 13.1% of the medical area, or 11,700 sq.m, for works amount of 29,250,000.00 € plus VAT and technical expenses, corresponding to the amount financed, will be recompressed in Management Plan 4.

For the resources that will become available after works are tested and the structure is activated, approximately from 2031 to 2034, the shares will be invested in the technological modernisation of the areas of the "Day Hospital" to purchase equipment and furnishings recovered from existing structures. It is guaranteed that the intervention will be functional and operational at the time of testing the New Hospital of Busto Arsizio and Gallarate.

Sums to be allocated to the financing of health-related construction works.

PG4 **€ 37,776,350.83**

2020	2021	2022	2023	2024	already available
€ 2.996.446,51	**€ 4.208.904,33**	**€ 2.804.304,79**	**€ 5.841.162,61**	**€ 2.383.496,39**	€ 18.234.314,63
2025	2026	2027	2028	2029	available during construction
€ 6.142.894,40	**€ 5.817.305,85**	**€ 2.047.320,26**	**€ 1.711.321,97**	**€ 1.056.408,84**	€ 16.775.251,32
2030	2031	2032	2033	2034	available after construction
€ 125.762,96	**€ 132.051,10**	**€ 176.068,08**	**€ 314.407,33**	**€ 2.018.495,41**	€ 2.766.784,88

A breakdown of financing for health-related construction

During the design phase, the designers will be asked to develop the day hospital in order to make the works easily identifiable and accountable for ministerial indications.

The two management plans cannot be overlapped, and there is no double funding with PNRR resources and art. 20 **Law 67/88.**

works related to the resolution of the following environmental sustainability topics that will be recompressed in **Management Plan 5** must meet these three main requirements:

1. Environmental quality of outdoor spaces: works to ensure the protection of natural resources of the environment, air, water, soil, ecosystem of fauna and flora, landscape, natural energy sources. Example: to protect underground aquifers from pollutants, parking lots will be underground and equipped with suitable filter layers for rainwater treatment with special systems for separating and collecting polluting oils.

2. Consumption of resources: In addition to the installation of a solar panel system for the production of domestic hot water, installation of systems for the production of electricity from renewable sources is planned. In addition, the collection and reuse of rainwater from the roofs of buildings is planned by constructing special tanks for collection, the related distribution network and outlets for use.

Sums to be allocated to environmental sustainability and efficiency measures PG5

€ 65,179,222.78

2020	2021	2022	2023	2024	already available
€ 5.494.113,78	**€ 7.668.800,81**	**€ 5.093.406,65**	**€10.661.616,54**	**€ 4.176.614,58**	€ 33.094.552,36
2025	2026	2027	2028	2029	available during construction
€ 9.984.045,06	**€ 9.455.452,50**	**€ 3.282.769,90**	**€ 2.798.754,32**	**€ 1.813.639,71**	€ 27.334.661,49
2030	2031	2032	2033	2034	available after construction
€ 215.909,48	**€ 226.704,96**	**€ 302.273,34**	**€ 539.773,79**	**€ 3.465.347,36**	€ 4.750.008,93

A breakdown of financing for environmental sustainability and energy efficiency

3. Quality of materials: Construction works shall prioritise recyclable, reclaimed, locally sourced building components and construction technologies, containing renewable and durable raw materials, with reduced energy values and incorporated greenhouse gas emissions, respecting the well-being and health of the inhabitants. Particular attention will be paid to the building envelope.

The works attributable to the amount financed are:

4. Technology Station
5. Hanging vegetation coverage (hospital structure)
6. Vegetation roof coverage (parking lots)
7. Woodland Compensation
8. Sources of energy production.

For the resources that will become available after testing the works and activating the structure, approximately from 2031 to 2034, the shares will be invested in the construction and arrangement of the green areas, works that do not affect operations of the hospital structure at the time of testing the New Hospital of Busto Arsizio and Gallarate.
During the design phase, designers will be asked to develop the project of works of environmental sustainability and energy efficiency for an amount corresponding to the PG5 in order to make the works easily identifiable and accountable for the purposes of ministerial indications.

ART. 20 OF LAW 67/1988
The construction of the New Hospital of Busto Arsizio and Gallarate quantified at an amount of 440 million euro, including preliminary studies, acquisition of areas, compensation and environmental adjustments, will be completed with the following resources:

- for 320,192,205.00 euro in the shares referred to in art. 20 of Law no. 67 of 11 March 1988 reserved for the Lombardy Region for signing Programme Agreements;
- for €**16,852,221.36** from resources pursuant to art. 5 bis of Legislative Decree 502/92, as introduced by Legislative Decree no. 229/99, pursuant to Lombardy Regional Resolution no. XII/2478 of 03/06/2024

The sum of the funds with those in point 1.2 guarantee implementation of a functional and operational intervention. It must be said that these resources cannot be overlapped with the two management plans of Law 160/2019 and with PNRR resources.

7

Minimum Environmental Criteria

The following chapter summarises the requirements related to the preliminary guidelines for the Minimum Environmental Criteria as per current legislation.

Minimum Environmental Criteria

With this project, the Valle Olona LHA contributes to achieving the environmental objectives set out in the Action Plan for Environmental Sustainability of Consumption in the Public Administration Sector (PNA GPP), introduced with the Environment Ministerial Decree of 11 April 2008 and updated with the Environment Ministerial Decree of 23 June 2022 amended by the Corrective Decree of 5 August 2024.

In compliance with articles 57 and 83 of Legislative Decree 36/2023 and subsequent amendments, the Minimum Environmental Criteria (CAM), issued by the competent Ministry and applicable to the project, are an integral part of the Technical Performance Specifications.

CAMs are used in various sectors, including construction, infrastructure and services. They are a key tool for public administrations in achieving sustainability and environmental protection objectives.

The main objectives of CAMs are:

1. **Promotion of Sustainability**: Encourage the use of sustainable resources and ecological construction practices.
2. **Energy efficiency:** Improve the energy efficiency of buildings and reduce energy consumption.
3. **Waste management**: Promote the reduction, reuse and recycling of materials.
4. **Air and soil quality**: Reduce the emission of pollutants and improve indoor and outdoor air quality.
5. **Protection of Biodiversity**: Safeguard local

ecosystems during construction and building management.

The requirements are binding in the case of public initiatives and represent fundamental criteria to achieve the design intentions in relation to environmental and energy sustainability, as well as landscape integration.

To demonstrate how the objectives are to be achieved, the designer will have to produce a CAM report, a mandatory design work that will have to be prepared at all levels of design, from technical and economic feasibility to executive.

In addition, the winner will have to provide a **CAM Report** in which, for each criterion, information is provided relating to:

- The **design choices** that ensure compliance with the criterion;
- **Works** in which references to requirements related to compliance with minimum environmental criteria can be found;
- The **requirements of materials** and construction products in accordance with the minimum environmental criteria contained in Ministerial Decree (MITE) no. 256 of 23/06/2022 Official Gazette 183 (CAM Edilizia) indicates the means of proof that the executor of the works must submit to the Works Supervisor.

The Report should also highlight the **design context** and the reasons that led to the possible partial application or non-application of minimum environmental criteria, such as:

- Construction product or material not covered by the project;
- Particular site conditions that prevent full application of one or more minimum environmental criteria, for example, the small intervention area in consolidated urban areas, which hinders full compliance with the percentage of permeable soil or the impossibility to modify the façades of existing buildings to ensure the required performance on natural lighting.

The designer, through the analysis carried out in the Report, integrates the project with the technical specifications resulting from the application of the criteria contained in the reference chapters, as specified below.

Territorial-urban technical design specifications

The intervention implies changes in the state of the places, as it is a new construction. As also specified in the Document on the Feasibility of Project Alternatives (DOCFAP), it is to be considered that the area identified for the location of the New Hospital

is located within a territorial context of high environmental and landscape value to be protected and enhanced. It is the last unitary strip of green areas adjacent to the Lombard Park of the Ticino Valley and marks the boundary with the Municipality of Gallarate.

The objectives that will have to be taken into account pursuant to Ministry of the Environment Decree no. 256 of 23/06/2022, with particular reference to urban-territorial aspects, have the purpose of:

- Reducing the environmental pressure of interventions on landscape, morphology, ecosystems and urban microclimate;
- Contributing to the resilience of urban systems against the effects of climate change;
- Ensuring adequate levels of urban environmental quality (services, technology networks, sustainable mobility, etc.).

The following **criteria** should be particularly considered:

- **Naturalistic and landscape insertion**;
- **Permeability of the territorial area**;
- **Reduction of the "summer heat island"** effect and air pollution;
- **Reduction of the impact on the** surface and underground hydrographic system;
- **Primary infrastructure**;
- **Secondary infrastructure and sustainable mobility**;
- **Energy supply**;
- **Report on the state of the environment**;
- **Water saving**.

The arrangement of green areas should be properly evaluated, defining the tree and shrub species to be planted in these areas, taking into account the function of absorption of pollutants in the atmosphere, microclimate regulation and using essences characterised by reduced water requirements, resistance to plant pathologies, absence of harmful effects on human health, as well as design solutions that facilitate **maintenance**.

The assessment will have to take into account the ecosystem present, encouraging the reconnection of the habitats outside the area, existing or envisaged in the plans and programmes.

In addition, it should be noted that the area affected by the AdP has been identified in the provincial Forestry Plan (PIF) as an area intended to receive compensation interventions (Table 11 B of the PIF).

The energy supply system (electrical and thermal) will have to cover some or preferably all of the needs, through the installation of photovoltaic systems and heat pump systems. The energy and economic viability of a CHP or geothermal plant will be assessed, where appropriate.

The design solutions related to **energy supply**, the type of essences identified for green areas, and the choice of permeable materials (draining materials, green surfaces, floors with open mesh or grid elements, etc.) and with an SRI (Solar Reflectance Index) of at least 29, will contribute to reducing the impact on the microclimate and air pollution. With regard to roofs, the use of **green roofs** should be privileged.

In order to reduce the impact on the surface and underground hydrographic system, interventions must be provided to hinder and/or prevent erosion, compaction, landslide or flood phenomena and, in particular, those necessary to ensure a correct flow of surface water on green areas such as drains, which will be designed according to naturalistic engineering techniques and using natural materials as far as possible. With regard to groundwater, actions will have to be defined to prevent spillage of pollutants onto the ground and underground, and to protect the building. To contain the phenomenon of runoff of impermeable surfaces, it is important to provide for the conveyance of first rainwater distributed on potentially polluted surfaces, called drains (road surfaces, parking areas, building covers, etc.), in rainwater collection systems equipped with specific purification plants in relation to the type of pollutants present.

With regard to primary infrastructure, design strategies must be adopted to obtain the necessary authorisations to acquire the qualification, ensuring correct environmental inclusion of the work in the surrounding context through:

- The study and reconstruction of a noise propagation model for the installation of sensitive receptors such as the hospital in question;
- The collection, purification and reuse of rainwater;
- The choice of lighting systems with low consumption and that guarantee minimisation of light pollution. In addition, on the basis of the needs that emerge, it will be possible to define strategies to promote sustainable mobility and implement them through specific design choices.

Technical design specifications for buildings

Regarding the Building (Technical Design Specifications for the Building), criteria related to **energy aspects** (both supply and performance), **internal environmental comfort**, **and Life Cycle Assessment (LCA)** take over. Also pursuant to Ministerial Decree 256/2022, as defined in Chap. 2.4, the criteria to be analysed are:

- Energy performance;
- Interior lighting systems;
- Inspection and maintenance of heating and air conditioning systems;
- Airing, ventilation and air quality;
- Thermal well-being;
- Natural lighting;
- Shading devices;
- Air tightness;
- Electromagnetic pollution in indoor environments;
- Acoustic performance and comfort;
- Radon;
- Work maintenance plan;
- Disassembly and end of life.

With regard to energy requirements, please refer to the previous point.

In order to encourage **water saving**, the project should:

- Ensure **sustainable use and water** protection by providing facilities that can optimise this resource during its use;
- Provide for the **collection of rainwater** for irrigation and/or sanitary discharges, implemented with systems built according to UNI/TS 11445.

Systems of flow reduction, flow control, water temperature control and the use of sanitary appliances with controlled drains will then be defined. A **water monitoring system** will also have to be provided.

With regard to **lighting aspects**, studies will have to be conducted to ensure adequate sun exposure based on layout and orientation; correct sizing of the shielding elements; specific lighting studies for health and work environments.

With regard to **acoustics,** the sound response of rooms dedicated to waiting and rest will be studied using specific software, in order to define shapes, materials and surface finishes that allow the achievement of high standards of acoustic comfort.

In addition to the technical and performance characteristics of the building, the chapter includes: a criterion that examines the **maintenance plan** of the building with reference to the verification of environmental performance levels (qualitative and quantitative), and a criterion that analyses **end-of-life disassembly**, providing that at least 70% weight/weight of the building components and prefabricated elements used in the project, excluding installations, is subject, at the end of its life, to disassembly or selective demolition (deconstruction) to then be subjected to preparation for reuse, recycling or other recovery operations. This verification requires preparation of a plan for disassembly and selective demolition.

Technical specifications for construction products

Environmental requirements for construction products are defined, where for **construction products equipped with harmonised standard**, Declarations of Performance (DoP) must be made in accordance with Regulation No. 305 of 9 March 2011 and Legislative Decree No. 106 of 16 June 2017.

Where the use of materials from recovery processes, recycling, or consisting of by-products is envisaged, reference is made to the definitions provided for by Legislative Decree no. 152 of 3 April 2006, as supplemented by Legislative Decree no. 205 of 3 December 2010 and the specific procedures referred to in Presidential Decree no. 120 of 13 June 2017.

As evidence of the recycled or recovered matter content of by-products, certificates shall be provided stating:

- Name of the certified product;
- Percentage value of recycled matter required;
- Release and expiry dates;
- Certification and/or declarations of accredited bodies in the environmental field in relation to the type of material considered, such as: an environmental declaration of Product, the "ReMade in Italy" certification with indication on the label of the percentage of recycled material or by-product, etc.

The special tender specifications, in the part relating to the characteristics of the materials, will have to be supplemented with the relevant criteria for the different materials in terms of performance and percentage of components from recovery, recycling, or by-product processes, including the technical specifications and the relevant means of proof.

The means of proof of conformity indicated above shall be submitted by the supervisor to the Works Supervisor for the necessary verifications prior to acceptance of the materials on site.

Pursuant to Ministerial Decree 256/2022, the criteria to be analysed are:

- Emissions to indoor environments (indoor pollution);
- Concrete packed on site and pre-packaged;
- Precast products in concrete, autoclaved aerated concrete and vibro-compressed concrete;
- Steel;
- Brick;
- Wood products;
- Thermal and acoustic insulation;
- Partitions, against perimeter walls and false ceilings;
- Stone and mixed masonry;
- Flooring;
- PVC windows and blinds;
- PVC and Polypropylene pipes;
- Paints and varnishes.

Technical design specifications for the construction site

The criteria of this chapter concern the project design, and are aimed at the **organisation and sustainable management of the site**. Hence, they are verified through the CAM Report, which must highlight:

- The ante operam status;
- The planned actions;
- The resulting achievable results;
- The post-op status.

The designer will have to integrate the results of the application of these criteria in the construction project and in the special tender specifications of the executive project, and explain in the CAM Report how the project has taken them into account, pursuant to Ministerial Decree 256/2022, as defined in Chap. 2.6. The criteria to be analysed are:

- Environmental performance of the construction site", which requires evaluating the environmental aspects of site preparation and operation activities that must be carried out by providing for the following actions: identification of possible critical issues related to the impact on the construction site area, measures to be taken to protect the natural resources, landscape and cultural history present, protection from noise and vibration, protection from gases and pollutants, protection from dust and fumes, energy and water saving, separate waste collection, etc.
- Selective dismantling, recovery and recycling;
- Preservation of the surface layer of the soil;
- Dumps and fills.

Guidelines for the sustainability of the intervention

The guidelines that emerged from the Environmental Report referred to in the "Accordo di Programma" Strategic Environmental Assessment (VAS) are given below.

The project must aim at **the highest degree of self-regeneration and low maintenance. It must guarantee quality and multifunctionality:** ecological (aspects of environmental health, improvement of the microclimate and aspects of biodiversity), recreational use, cultural, for psychophysical well-being, by:

- Trying to minimise the introduction of waterproof surfaces to **optimise ecological functions** and the possibility of providing Ecosystem Services (SE);
- Using permeable surfaces to **facilitate the infiltration of** rainwater;
- For the remaining green areas, providing large areas occupied by **tree**

and/or shrub vegetation in structured patches, in relation to the wooded areas on the margins and capable of compensating at least partially for SE deficits related to the regulation of microclimate and CO2;

- Placing the currently planned road level parking spaces in the structure, or underground (if adequate resources are present), in order to **maximise the presence of open spaces available for green accommodation**. Use the excavation lands for morphological modelling interventions aimed at improving the landscape insertion of the transformation;
- Equip parking lots and paved areas of the paths and internal roads with **shading trees** in order to reduce the heat accumulation of paved surfaces and ensure microclimatic improvement;
- Provide for the planting of seed mixtures for **flower lawns** in lawn areas on both deep and hanging vegetation. Preferably select native species with scalar blooms in such a way as to ensure progressive blooms during the year by supporting the SE of Pollination;
- Create **water collection basins** that can be later used to irrigate green areas;
- Maintain **usability of hospital green areas** by the population;
- Provide **production-oriented green spaces**, reserved for hospital catering aimed at prevention through food rehabilitation;
- Create the part of the **urban park** inside the project area (AdP) while constructing the building structure and, as far as possible, anticipate greening of the area;
- Use vegetation for the construction of filter zones and for **CO2 capture**;
- Provide for the construction of **noise containment devices** integrated into the park project, for example using appropriate terrain models aimed at performing filter function between infrastructural areas and the green and medical areas provided inside the project area (AdP);
- Provide suitable measures aimed at **mitigating disturbances and creating elevated buffer strips**, or other devices capable of effectively mitigating the various infrastructural impacts;
- Refer to **Best Management Practices** (BMP) or **Nature Based Solutions** (NBS) in future design development, which are able to respond to deficits related to the delivery of the SE Regulation of the water cycle. Water and urban drainage management will have to use integrated natural solutions that allow to improve the hydrological response of the urbanised project territory, obtaining additional benefits in terms of water quality, increased biodiversity and increased use of public areas. The interventions should concern both the design of interventions on roads, squares and infrastructure connected to them, and the redevelopment and/or construction of green areas;
- Envisage green interventions for compensatory purposes (arising from the transformation of forest soil);
- Provide landscape interventions placed in support of the hospital structure in order to correctly insert the work itself;
- Adopt typological models that refer to the study of potential vegetation by examining the current landscape both for morphological aspects and for the plant cover, considering the pedological characteristics, an aspect that strongly conditions the settlement of vegetation;
- Compensation for the deficits related to the loss of CO2 Regulatory SE both with the introduction of new wooded areas, and with interventions to redevelop existing wooded formations within the ecological corridor of Cascina Tangitt. However, in view of the extensive presence of wooded areas within the Province of Varese, in place of the construction of new wooded areas (for compensatory purposes), it is proposed to evaluate the possibility of carrying out interventions (of equal economic importance) aimed at redeveloping the existing woodland. In particular, given the proximity of the intervention area to the Ticino Park, improvements to the composition and structure of the Park's forests are considered possible.

Finally, the spatial organisation of the new sector informed by the above guidelines should improve performance of the estimated results for macro indicators:

- Draining Surface Index;
- Btc Media and Btc Hu, with positive effects also expected on verified SEs.

A reduction in disturbed areas is also called for.

Timeline and Phases

The chapter collects the programmatic and temporal request, thus allowing to precisely define the evolutionary steps of the intervention with the relative timing and time schedule.

• Award of the Competition	210 days, from indiction
• Conducting investigations and surveys	40 days, from the award
• PFTE development and delivery	180 days, from the signing of the contract
• Approval and Authorisation Titles (CDS and VIA)	120 days, from completion of the PFTE
• FTE verification	60 days, from the award
• PFTE approval	5 days following the verification and authorisation certificates of the PFTE

Design phase schedule and obtaining authorisations

Starting from the development of all project levels, up to the award of the works, the development and the conclusion of the latter, barring unforeseen events, an overall timeframe of eight and a half years was defined.
Following the signing of the Programme Agreement of 24 October 2023, Valle Olona LHA has given Aria S.p.A. a mandate. (October 2024) to draw up the Technical and Economic Feasibility Project, through an international design competition.
The expected timeframes for the individual phases of design development are estimated as shown in the table on the following page.

• Service order for PE start	1 day after signing the relevant contract;
• PE Delivery	90 days;
• EP verification	30 days;
• PE approval	5 days after PE verification

Expected timeframe for the executive design phase.

• Call for tenders	30 days after PE approval
• Works award	180 days, from issuance of the call for tenders
• Underwriting the contract	45 days, from the award

Scheduled timing for the execution phases, tender and works

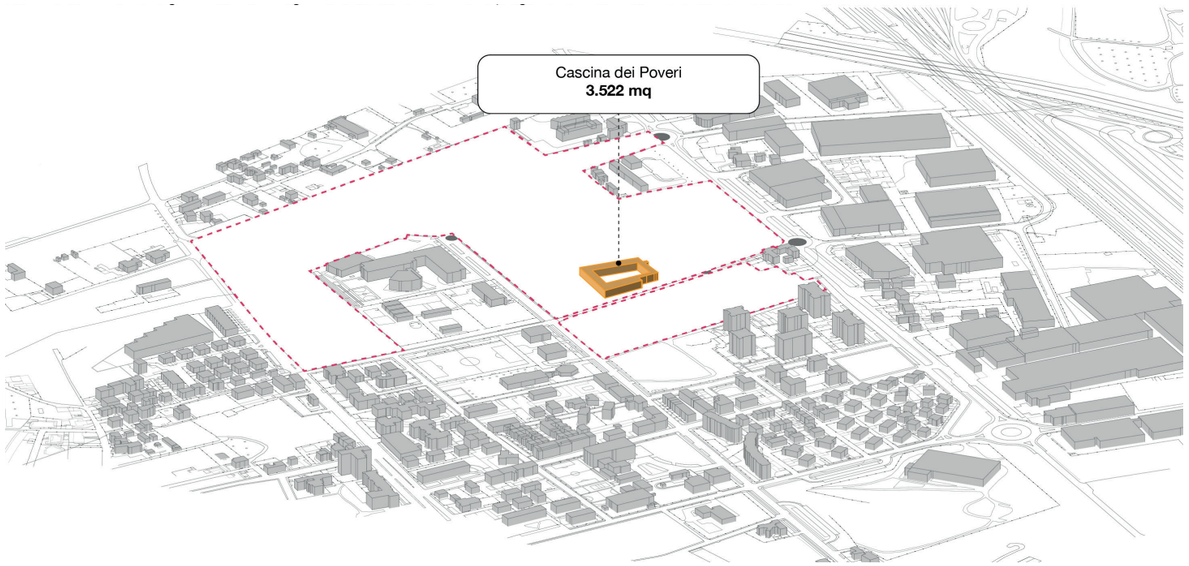
Subsequently, the works will be completed as identified in the PFTE for legal reasons related to funds of art. 1 Law 160 of 27 December 2019 paragraph 14 – Fund for the release of investments of the State Central Administrations for the development of the country.

• Start of work	1 g after signing the relevant contract;
• End of work	195 days;
• Testing and preparation hospital structure	180 days;
• The New Hospital activation will be structured in two different phases, each corresponding to the transfer of the existing single hospital	

9

Environmental Remediation

The chapter details the requirements relating to any reclamation needs and detailed analysis for the area under intervention in order to ensure the urban and environmental feasibility of the project.



Schematization of the site where the environemental remediation will be conducted

The site is a mainly wooded and agricultural area located in a residential, industrial and commercial context. The wooded areas cover much of the site and the largest portion is located in the western area, behind the Enrico Tosi Technical Economic Institute. Other smaller wooded areas are recognised in the northern and eastern part.
The largest agricultural area is located to the south and is currently unused, while other agricultural or uncultivated areas are located along Viale Stelvio and near the Cascina dei Poveri.

The following anthropogenic elements are located within the site: the Cascina dei Poveri, the Church of S. Bernardino, a shack area, three car parks, piles of soil, probable waste and mixed waste.
The Environmental Characterisation Plan has been drawn up on the areas, and a risk analysis is being drawn up. Parallel to the development of the project design for the competition, the Reclamation Project will be developed, with the consequent authorisations.
Coordination between the two projects will, therefore, be necessary.
The reclamation works of the areas (land and water) and construction of the Great Malpensa Hospital will be entrusted with a single tender.

10

Materials, Elements and Components

The chapter collects the specific requirements regarding the use of materials, technologies and components that are useful for the construction of a future-oriented hospital by developing the principles of sustainability, innovation and performance monitoring.

Materials, Elements and Components

In addition to performance requirements for the design of a future-oriented hospital, a particular aspect to consider concerns the theme of materials, elements and components. The design of materials, construction elements and architectural components of a contemporary hospital must meet specific stringent and diversified needs, in line with the functional, technological and health-related requirements of a complex and highly regulated environment.

Among the fundamental criteria for hospital design, three essential aspects emerge:

1. **Maintainability**: the selected materials and technological components must ensure efficient management and reduced frequency or operational agility of routine and extraordinary maintenance interventions, contributing to the economic sustainability of the structure. It is essential to favour surfaces and finishes resistant to aggressive detergents and disinfectants, while maintaining their aesthetic and functional characteristics over time. It is also suggested to verify the ease of inspection, maintenance and/or replacement of plant and technological components in order to ensure the least possible impact on the health-related activity of the hospital and the least discomfort to patients, visitors and operators.
2. **Flexibility**: the hospital must be conceived as an adaptable body, able to respond quickly to new health needs, functional reorganisations or emergencies. Materials and components must, therefore, be easily removable, repositionable or reusable, favouring a dynamic and resilient spatial layout. The possibility of dismantling the solutions to be pursued also thanks to the implementation of industrialised and/or prefabricated solutions ensures an integrated approach to the life cycle of the entire intervention.
3. **Durability**: the solutions adopted must ensure optimal performance in the long term, resisting wear and tear and physical, chemical and biological agents, especially in high use environments such as hospitals.

Innovative and Sustainable Materials

The use of innovative materials is crucial to meet the highest quality standards and promote the health and well-being of both users and operators. In particular, care-related infections have played a decisive role in the spread of the COVID-19 pandemic, and their mitigation will be increasingly important in the near future. For this reason, in synergy with risk monitoring and management activities, it is essential to use high performance, durable and easy-to-clean materials, in relation to medical needs. In particular, it is necessary to introduce innovative materials to reduce the bacterial (and viral) load on finishing surfaces, including eco-active materials and photocatalytic paints, also characterised by high performance and flexible use.

The recommended solutions include:

- **Eco-active materials**, such as photocatalytic surfaces and nanoparticle-treated fabrics, can break down microbial load and improve indoor air quality.
- Antibacterial and antiviral **finishes or systems,** particularly suitable for functional areas with high contact surfaces, such as handles, handrails, lighting

systems, wall coverings and worktops.

- **Sustainable materials or systems** with low environmental impact and certified according to international standards, able to guarantee not only high performance but also a reduced life cycle in terms of emissions and resource consumption.
- **Washable and removable technical fabrics**, which are useful for flexible separations in emergency settings or to increase user privacy, ensuring easy maintenance and adaptability to changing health needs.

Monitoring Air Quality

Indoor air quality is a strategic element to control **nosocomial** infections and for the overall well-being of patients and healthcare professionals. It requires the implementation of continuous air quality monitoring systems in all areas of the hospital, with particular attention to critical areas. Such systems must detect parameters such as: particulate concentration (PM10, PM2.5), presence of volatile organic compounds (VOCs), levels of carbon dioxide (CO2) and oxygen (O2), humidity and temperature.

In parallel, the use of mechanical controlled ventilation (VMC) systems with advanced filtration, in synergy with low VOC materials, will help create **healthy environments that comply with the criteria of current regulations.**

Integrated approach

The choice of materials and components must be integrated with the overall design strategies, enhancing their ability to interact positively with other aspects of the building. For example, easily sanitised surfaces must be combined with automated or robotic cleaning systems; high thermal inertia materials can support energy efficiency strategies; and resilient, ergonomic flooring can reduce the risk of fatigue for healthcare professionals. The effectiveness of these strategies will have to be monitored over time according to an **Evidence & Practice based design approach.**

Materials and technological components are, therefore, a key asset in the design of a modern hospital, directly influencing its functionality, sustainability and perceived comfort. Design choices must, therefore, be based on a **balance between innovation, sustainability and meeting performance specifications**, while ensuring a safe, welcoming and resilient hospital environment.

Bibliography and Annexes

The main bibliographic sources of technical and scientific literature consulted or useful to support the development of design proposals with reference to the main evolutionary trends of health infrastructures are reported.
In addition, a list of annexes is given which form an integral part of the information available.

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Annexes

Annexes

01 DPP2021
Preliminary Document for Designing the New Hospital of the cities of Busto Arsizio and Gallarate “A new hospital, in a new hospital for a changing territory”, July 2021

02 DOCFAP
Feasibility document of design alternatives (DOCFAP) for the New Hospital of the cities of Busto Arsizio and Gallarate including the urban planning study and related graphic drawings, July 2023

03 ADPQ_VAS
Programme agreement aimed at the construction of the New Hospital of Busto Arsizio and Gallarate (pursuant to art. 7 of Regional Law 29 no. 19 of November 2019 and art. 34 of Legislative Decree no. 267 of 18 August 2000, with related annexes and Strategic Environmental Assessment (VAS), July 2023

04 FEASIBILITY STUDY FOR FINANCING AUTHORISATION
Feasibility Study for Financing Authorisation under the Investment Programme art. 20 Law no. 67/1988 supplementary programme agreement for the health investment sector. New Hospital of the cities of Busto Arsizio and Gallarate. June 2024

Sistema Socio Sanitario
Regione Lombardia
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Design Guidance Document for the Great Malpensa Hospital