

# Chapter 2

## Current Scenario Analysis

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**Abstract** The analysis of a scenario as complex as a healthcare facility cannot be accomplished only through theoretical studies: researches have therefore been conducted by taking into account the mainly acknowledged theories and by directly experiencing the hospital reality with a user-centred perspective. The stakeholders' analysis highlighted how diverse are the groups of people which may have any interest in healthcare, ranging from Public Administration to employees and patients, to volunteers and local communities. However, their needs and the possibly arising controversies can be defined, taking into account overlapping and interrelationships, according to the three pillars of sustainability: the environmental, social and economic spheres. Through the analysis, by means of interviews and on-site visits, of different case-studies in Italy and sustainability best-practices around Europe were individuated the Niguarda Hospital, the Hospital del Mar, the Humanitas Research Hospital, the Meyer Hospital, the New Legnano's Hospital and the next New Karolinska Solna Hospital. It was then possible to identify more specific and concrete users' needs, to be translated into specifications for the newly developed tool. Every hospital represents a peculiar reality, dealing with many common concerns, but also with numerous issues tightly related to the local context.

**Keywords** Stakeholders · Niguarda Hospital · Hospital del Mar · Humanitas Research hospital · Meyer Hospital · New Legnano's hospital · New Karolinska Solna Hospital

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The scenario analysis necessary to the development of a user centered tool was carried out mainly through two different means.

On one hand, a focused literature analysis, aiming to better understand the issues related to operative hospitals and their design process and also to deepen the different facets of the sustainability concept.

On the other hand, on field studies, conducted by visiting some of the most innovative and modern hospitals in Italy and Europe and through comprehensive meetings with scholars and designers who already tackled the issue of sustainability in healthcare.

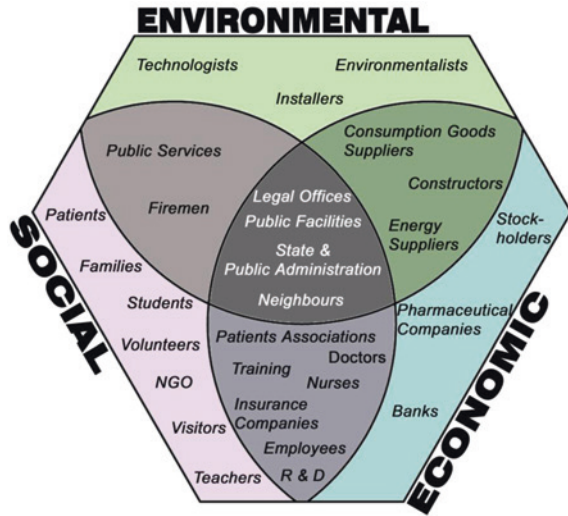
## Stakeholders Analysis

Considering the extremely delicate role covered by the healthcare structures both within local communities and wider society in general, the number and variety of stakeholders who could claim an interest in the Sustainable Healthcare project is noteworthy. Such stakeholders range from interest groups who directly interact with hospitals on a daily basis, such as employees, patients, visitors, suppliers of goods and services, to those who find themselves to interact indirectly but continuously with hospitals, being located next to these structures, as the local communities. An important group of stakeholders is also represented by the local public and private institutions who affect or are affected by the hospital's activities, varying from the Non-Governmental Organizations (NGOs), involved in supporting the patients and their family members, to the local Public Administration, which approves the structure's budget on a yearly basis. In this scenario it is fundamental to have an innovative approach that takes stakeholders' opinions and needs into consideration, establishing cooperation between them and designers.

Considering the scope of the project, which focuses on improving the hospital's performance under three different sustainability profiles, the stakeholders were divided according to the sustainability area they belong to (Fig. 2.1). The relationships between them were studied together with the main controversies which had to be considered during the development of the identified evaluation tool. Controversies, quoting Prof. T. Venturini, "are the place where the most heterogeneous relationships are formed" (Venturini 2009). The understanding that, by definition, the requirements of different stakeholders are likely to be in conflict with one another and that the project would therefore have to define and justify a certain level of compromise was therefore, of course, a crucial step in the project's development.

The study of stakeholders and the analysis of relations among them have been used to define the path which led to the creation of the assessment system. This was done while keeping in mind the necessity to balance the different topics of sustainability and to satisfy all the different stakes present during the hospital design and operative phase.

**Fig. 2.1** The relationship between the sustainable healthcare project's stakeholders



### Learning by Visiting

As the method of work clearly underlined, following the preliminary study of the ‘state of the art’ situation concerning existing healthcare sustainability evaluation systems, sustainability issues in operative and in-design hospitals and, especially, the different standpoints of scholars and professionals on the subject, the project proceeded with the identification of a list of ‘best practices’. The project’s activities therefore shifted from an initially theoretical approach, aiming to help the understanding of the context within which the healthcare structures are required to operate, to a more practical one, where the findings and impressions gathered during the academic phase were compared, developed and discussed directly with professionals, academics and hospital users, such as patients and visitors.

In order to better satisfy the need to observe and understand the operative hospitals’ issues from a sustainability-focused point of view, the different stakeholders were contacted according to the sustainability sphere affected by their activities, rather than by their individual role. For example, hospital staff was interviewed on separate occasions, first for its role as stakeholder in hospital humanization (one of the founding pillars of social sustainability) and then as manager of the different wards (focusing on economic sustainability). These face-to-face interviews involved a variety of profiles: architects and engineers dealing with the hospital’s preservation and continuous maintenance; administrative executives and doctors handling managerial issues; technicians and members of staff responsible for the operational maintenance of the structure and of its installations; doctors, nurses, patients and visitors experiencing the daily impact of the hospital’s functioning;

local communities and public administrators involved in the effect that the hospitals' presence had on their neighborhoods.

Furthermore, interviews were included in wider on-site visits to various hospital structures, visits which allowed to understand and appreciate the complexity of these structures as a whole, going beyond the own area of specialization, and therefore to develop a true multidisciplinary point of view. During the scenario analysis some buildings were specifically used as case studies.

These structures, both Italian and foreign ones, vary from buildings built in recent decades to hospitals that have been converted over the course of their lifetime. The selected case studies, internationally identified as *best practices* as far as building sustainability issues are concerned, were analyzed and visited, gathering information for each building according to:

- economic sustainability;
- social sustainability;
- environmental sustainability.

## Niguarda Hospital, Milan, Italy

The Niguarda Hospital (Fig. 2.2) is located in the northern area of Milan. The hospital was founded in the 30s. The complex, constituted by pavilions, has a monumental entrance and includes art elements, such as statues and decorations, which recall the ancient Lombardy hospitals (Crippa and Sironi 2009).

During the years the complex and its pavilions were subjected to several changes, additions, renovations and transformations, underlying the strong relationship and integration that the buildings have with their surroundings.


DIMENSIONS		
		333'635 m <sup>2</sup>
CONSTRUCTION'S YEARS		
		1932-1939/2009-2014
CUSTOMER		
		A. O. Niguarda Cà Granda
NUMBER of PATIENTS' BEDS		
		1'308
NUMBER of EMPLOYEES		
	4'100	
HOSPITAL'S TYPOLOGY		
	General Hospital	

Fig. 2.2 Aerial photograph of the Niguarda Hospital

Following a list of the most noteworthy practices applied at Niguarda Hospital towards sustainability.

Economic sustainability:

- Realization of an annual *Sustainability Report*, analyzing the structure's budget and the social and environmental issues.
- Development of automated transports due to the concentration of healthcare activities in three different poles. The historic underground connections have a length of about 4,300 meters, that are viable by small vehicles, and they reach all the buildings.

Social sustainability:

- Clear signals in order to favor user's sense of direction. The pavilion's numbering is progressive with numbers increasing from left to right.
- Wide internal courtyard with the function of commercial space reception information and waiting area.

Environmental sustainability:

- Integration and interaction between the newly developed and the existing buildings through the reuse of the historical heritage.
- Strong focus on green areas, which are easily accessible by patients.

## Hospital del Mar, Barcelona, Spain

Hospital del Mar is located in the area of Barceloneta (Fig. 2.3). Its story starts in the middle of the XX century, with the aim of transforming a degraded neighborhood into a new heart of the city. Today the hospital is undergoing a new transformation following the principle of the Phoenix, under the outstanding guide of Arch. A. De Pineda. Next to the hospital there is the new research center with a circular shape, accessible through a large entrance open to the public, which hosts several national and international innovative departments and laboratories (Capolongo 2006).

Following a list of the most relevant solutions applied at Hospital del Mar towards sustainability.

Social sustainability:

- Special attention to humanization and well-being through soft indoor colors and natural widespread light.
- Covered public square dedicated to meetings open to the public.
- Linear building with two floors topped by a projecting roof, overlooking the sea.
- Double corridor organization of offices and ambulatories in the first floor, which allows separation from staff and public ones.
- Separation, at small distance, of the hospital from the research center, to avoid intertwining with the flows related to on the medical wards' activities.

DIMENSIONS	
	30'000 m <sup>2</sup>
CONSTRUCTION'S YEARS	
	1989-1992
CUSTOMER	
	C. H. Barcelona
NUMBER of PATIENTS' BEDS	
	896
NUMBER of EMPLOYEES	
	2860
HOSPITAL'S TYPOLOGY	
	General Hospital



**Fig. 2.3** Aerial photograph of the Hospital del Mar

Environmental sustainability:

- Accessibility with public transports.
- Good integration with the urban context.
- Use of passive building systems for the new biomedical research center, e.g. an external coating constituted by a double skin of wood and glass.

## Humanitas Research Hospital, Rozzano, Italy

The Humanitas Research Hospital (ICH) is considered one of the most interesting hospitals in Italy as a concrete example of environmental, social and economic sustainability and of their holistic integration (Fig. 2.4).


As stated in a Harvard Business School study, the hospital has an innovative design in which the wards and the medical services blocks are separated.

ICH has been certified by the Joint Commission International in 2002, 2006, 2009 and 2012, demonstrating to be one of the Italian best examples in terms of healthcare sustainability. Following a list of the most noteworthy practices applied at Humanitas Research Hospital towards sustainability (Colombo 2012).

Economic sustainability:

- Lean Transformation which aims to create a culture of continuous improvement in the quality of care provided to patients by seeking to eliminate waste.
- Internal developing courses, which, according to the Staff Education and Qualification department, proved to be more effective and an important source for individuals to feel part of a community.



DIMENSIONS		
		86'000 m <sup>2</sup>
CONSTRUCTION'S YEARS		
		1992-1996 / 2003-2007
CUSTOMER		
		Istituto Clinico Humanitas
NUMBER of PATIENTS' BEDS		
		747
NUMBER of EMPLOYEES		
		2000
HOSPITAL'S TYPOLOGY		
	University Hospital	

**Fig. 2.4** Aerial photograph of the Humanitas Research Hospital

Social sustainability:

- Architectural design configured around four light wells arranged in a square; in the medical service block, imaging, nuclear medicine and other services are located on the ground level, outpatient clinics on the first floor, operating rooms and ICU department on the second floor.
- Recovery wards placed in different wings of the same building.
- The project aims to minimize the distances that patients needed to be moved and maximized natural sunlight to create a pleasant outcome.
- Minimization of the distances that patients need to cover.

Environmental sustainability:

- Maximization of natural sunlight to create a pleasant environment.
- Walls of the medical service area built with plasterboard that allows future changing in response to new technology or changes in the patient flow.

## Meyer Hospital, Florence, Italy

The Meyer Children's Hospital (Fig. 2.5) is located in the area of Careggi, in Florence. The hospital was realized with the aim of giving new life to Villa Ognissanti, a milestone facility in the city's healthcare system dedicated to the cure of tuberculosis. Meyer's creative project was innovative from a variety of points of view: first of all it was fully designed for children, it was conceived to perfectly fit within the surrounding landscape and existing buildings and to be environmentally friendly (Del Nord 2006).

The project was demanding and challenging in its execution, but gave rise to a hospital capable of creating a wide system, involving its surroundings: other

DIMENSIONS	
	<b>34'000 m<sup>2</sup></b>
CONSTRUCTION'S YEARS	
	<b>2000-2007</b>
CUSTOMER	
	<b>A. O. U. Meyer</b>
NUMBER of PATIENTS' BEDS	
	<b>250</b>
NUMBER of EMPLOYEES	
	<b>1000</b>
HOSPITAL'S TYPOLOGY	
	<b>Children's Hospital</b>



**Fig. 2.5** Aerial photograph of the Meyer Hospital

than including a mimetic operation, Meyer's design concept allowed to develop a hypogeal building in the existing Careggi hill. Following a list of the most relevant solutions applied at Meyer Children's Hospital towards sustainability.

Social sustainability:

- Centrality of the young patient in the design concept.
- Selection of special construction materials, including glasses, which allow to contain the noise on the façade of the building within 50 dB during daytime.
- Positive humanization effectively achieved through indoor comfort, green and play areas, interrelation between external and internal spaces, use of natural and recyclable materials, widespread quality, absence of indoor pollution.

Environmental sustainability:

- Energy-efficient technologies and photovoltaic panels located on windows.
- Appropriate bioclimatic conditions ensured through the high insulation provided by the roof garden that concurs to energy balance and climatic comfort.
- Natural ventilation used to maintain an optimal micro-climate and a direct relation between inside and outside, reducing the sense of isolation.

## **New Legnano's Hospital, Legnano, Italy**

The new Legnano's Hospital is characterized by a modular structure that facilitates any future expansion (Colombo 2012). The structure is technologically advanced but at the same time user friendly. It consists of low-rise buildings, courtyards and



DIMENSIONS	
	<b>116'120 m<sup>2</sup></b>
CONSTRUCTION'S YEARS	
	<b>2006-2010</b>
CUSTOMER	
	<b>Ospedale Civile di Legnano</b>
NUMBER of PATIENTS' BEDS	
	<b>550</b>
NUMBER of EMPLOYEES	
	<b>1'776</b>
HOSPITAL's TYPOLOGY	
	<b>General Hospital</b>



**Fig. 2.6** Aerial photograph of the New Legnano's Hospital

squares and is divided into departments that ensure spatial contiguity between areas of greater interaction. The areas for hospitalization, diagnosis and treatment make up 50 % of the total area. The remaining 50 % is made up of areas that host services for the public, including shops (Fig. 2.6).

One of the biggest merits of this hospital is the new approach which was applied for its design and organization, including the following solutions, which are sustainability best-practices.

Social sustainability:

- Good flows project 80 % of the patients find their destination quickly on the first floor.
- Emergency department designed to have the shortest possible distance from every point of the structure; moreover external providers never get in contact with patients.
- Various campaigns to teach people about disease prevention and help them facilitating the process of interaction.
- Wards and operating rooms are planned according to the medical staff's needs and to a participatory policy.
- Flexibility of interior and technical spaces to face technology progress.
- Organizational solutions to provide maximum elasticity and autonomy to each part of the building. The innovative bidirectional structural system gives the possibility to use the spaces for almost all types of functions.

Environmental sustainability:

- The hospital is powered by a network of district heating and cogeneration.

## New Karolinska Solna Hospital, Stockholm, Sweden

The New Karolinska Solna Hospital, designed by White-Tengbom architects, can be considered a good example of sustainable hospital for the future (Fig. 2.7).

The goal of the new university hospital, which will open its doors to the first patients at the end of 2016, is to provide highly specialized healthcare and conduct basic research, patient-focused clinical research and education. Greater collaboration between healthcare and research will contribute to faster research findings towards the development of new treatments and drugs (Capolongo 2013).

The aim of the project is to reach the Gold class in the LEED certification system, through many examples of best practices in different fields, as listed below.

Economic sustainability:

- Mutual support between hospital and University, within the management of the County Council.

Social sustainability

- Distinct focus on the patient: patient's safety integrity and comfort are at the center.
- Purpose-built environment that facilitates the healing process and stimulates patients and staff.
- Attention to Daylight: daylight factor is higher than 1.2.

Environmental sustainability:

- Xeriscaping landscape to minimize water use and waste.
- Energy supply thorough district heating fueled by biomass and garbage.

DIMENSIONS		
		335'000 m <sup>2</sup>
CONSTRUCTION'S YEARS		2011-2017
CUSTOMER		Karolinska Institutet
NUMBER of PATIENTS' BEDS		1'600
NUMBER of EMPLOYEES		15'000
HOSPITAL'S TYPOLOGY		University Hospital

Fig. 2.7 Main entrance of the New Karolinska Solna Hospital

- Heating system powered by heat pumps; the energy consumption of the hospital is meant to be less than 200 kWh/m<sup>2</sup>.
- Use of innovative materials: copper has being limited and PVC was avoided.
- Double skin façade adopted to reach at the same time good energy and daylight performances.

## Sum up

As learned from both literature and in situ analyses of the previous case studies, the project's scenario appears complex, mainly due to the relevance that healthcare structures have within their communities and to the diverse competences and interests involved. Analyzing and meeting the different stakeholders allowed to understand the extent to which a hospital can influence its community on a variety of subjects, from environment to economy, and on different levels, from the local to the national one. This allowed to identify the needs to be satisfied and the subsequent requirements to be fulfilled by the developed solution, keeping in mind the necessary trade-off among the various stakeholders' different positions.

The parallel study of the most outstanding sustainability best practices in different European healthcare structures and their comparison to the current average scenario, particularly in the Italian reality, enhanced the comprehension of the main criticalities and the identification of feasible solutions to improve hospital sustainability. Direct in-situ observations promoted the broadening of the multidisciplinary approach, which characterizes this project, and allowed to deeply understand how tightly the different sustainability areas are related to each other.

Interviews with designers, staff and patients helped instead to highlight the main factors that concur to hospital sustainability. Such concrete experiences have been extremely helpful in filling the gap between academic theory and actual hospital needs, leading to the identification of the best method through which to consider such a complex scenario, without simplifying it. Considering the diversity of the social, environmental and economic needs of the different stakeholders, together with their relevance and urgency, it is to conclude that a tool to evaluate the sustainability of a healthcare structure should be as simple as possible, applicable in short time, not requiring high additional expenses and, especially, should produce a specific outcome, capable of pointing out the best strategy for sustainability improvement.

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