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Entrance elevation of the monumental courtyard of the SS. Annunziata. Photo: Marcello Raiano

Abandoned places, complexes and parts of cities. Regeneration and enhancement of monumental hospitals in the historic centre of Naples

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Abstract: Even before Covid - 19 although in the very center of the old town and historic center of Naples there were abandoned buildings and complexes, uninhabited and unused for decades. The cause is attributed to multiple reasons such as functional obsolescence, failure to adapt to intervening European standards in terms of hospital construction, technological facilities to standards, etc. The health crisis which strongly affected European societies revealed the fragilities of our healthcare systems. In Italy, a large number of COVID-19 patients congested hospitals while the continuity of essential services was interrupted at the expense of other needs. At the same time, the process of abandonment of historic buildings affects different monumental hospitals, such as the “San Giacomo degli Incurabili” and the “Carlo Forlanini” in Rome, or the “Gesù e Maria” Hospital, “San Gennaro dei Poveri” and the “Santa Maria del Popolo degli Incurabili” in Naples. This paper reports three case studies of Neapolitan historical hospitals regeneration proposals with the goal of strengthening the existing community healthcare system and developing energy efficiency and seismic improvement strategies in the spirit of sustainable development. Leveraging the flexibility of monumental hospitals, the proposed light retrofit interventions restore the historical healthcare functional destination ensuring also the reuse of such an heritage. The current research delineates an approach to the recovery and enhancement for social and cultural purposes of unused and abandoned historical hospitals. This approach can positively affect the quality of life of citizens and the use of health services, while recovering historical cultural heritage buildings.

Keywords: regeneration; historical hospital; sustainability.

1. Introduction

Even before Covid - 19 although in the very center of the old town and historic center of Naples there were abandoned buildings and complexes, uninhabited and unused for decades. The cause is attributed to multiple reasons such as functional obsolescence, failure to adapt to intervening European standards in terms of hospital construction, technological facilities to standards, etc. Another non-negligible cause was the earthquake of 11/23/1980, which rendered many buildings and monumental complexes unusable, including those converted to hospital construction. There were collapses of roofs, floors, entire masonry parts, and dangerous cracking frameworks opened up.

The health crisis which strongly affected European societies revealed the fragilities of our cities. The large number of COVID-19 patients who poured into hospitals has congested national healthcare systems. In Italy, the first European country hit by the pandemic, at the beginning of March 2020, the government imposed the so-called lockdown to mitigate the spread of the virus. This imposition limited, on one hand, the circulation of infections, on the other, especially in the most disadvantaged environments, has led to a serious economic crisis with an increase in unemployment mainly among the most subordinate workers. The economic crisis and the absence of a widespread health care system are additional risk factors for the general state of health of the population.

Among the indirect impacts of the pandemic there is also the reduction of screening activities. In Italy in the period January-September 2020, the performed oncological screening tests were cut by half in comparison to the same period 2019: leading to a total number of estimated undiagnosed of 13,011 cases. (Diana, Marmo, Polverino, 2020).

In this scenario, it emerged that community healthcare services, provided by means of primary care facilities, play a fundamental role in the resilience of the entire health system, and increase the system's preparedness to deal with pandemics. In this context, the wide local health authorities' asset in both numerical and superficial terms, (comprising hospitals, clinics, assisted residences, offices etc.) represents a key factor for possible community healthcare service upgrade. Such an asset is scattered particularly in big cities, outlining the historical link between urban development and places of care. Several Italian urban centres can count numerous monumental hospitals: historic places of care, with different origins, characterised by artistic-cultural richness, typological and constructive quality. These structures today are partially,

if not totally, abandoned. Contemporary hospitals require high technological and structural features which cannot be ensured by historical structures.

This process of abandonment of historical structures affects different monumental hospitals at national level, as the "San Giacomo degli Incurabili" and the "Carlo Forlanini" in Rome, or the "Gesù e Maria" Hospital, "San Gennaro dei Poveri" and the "Santa Maria del Popolo degli Incurabili" in Naples (Piana, 2001).



Figure 1 | The main facade of the Hospital of Incurables. Source: <https://www.napoligrafia.it/monumenti/complessi/incurabili/incurabili01.htm>

In this perspective, the city of Naples is an emblematic case study not only for the quantity of monumental hospitals placed inside the urban center and nowadays abandoned, but also for a series of evident characteristics that define the value of these structures: the artistic-cultural richness, the typological and constructive quality, and the strong and emblematic connection with the neighborhoods in which they are located. To date several monumental hospitals are unattainable. With the progress of high-tech care and its impact in structural and infrastructural terms, the strong original link between monumental hospital care spaces and the city around them has gradually been lost to the point that these structures are considered not sustainable to continue to serve as hospitals and thus abandoned. The framework of abandonment is widespread but, especially in the current context of the Recovery Plan (Italian Council of Ministries, 2021), these structures become resources to envisage possible regeneration interventions. The regeneration of existing historical hospitals enhances community healthcare systems and it is also in line with the need of a general renewal of the Italian hospital building stock. It is necessary to act on the existing built environment and transfer all the concepts of compatibility, use of

renewable energy sources, use of eco-friendly materials that are adopted for new buildings to the existing building stock and plan policies of adaptation in the regeneration process.



Figure 2 | Historical Pharmacy of the Hospital Complex of Santa Maria del Popolo degli Incurabili. Access from the courtyard of the Hospital of the Incurables. Italian Touring Club.



Figure 3 | Church of San Giacomo with the Ospedale of Incurabili on via del Corso. Giovanni Battista Falda.

2. State of the art of monumental complexes and buildings that are wholly or partly abandoned

For the valorization of partly uninhabited and abandoned buildings and monumental complexes, the starting point of research on the technical-constructive characteristics of the monumental hospital buildings themselves cannot be separated from the study of the architectural complex or urban core and its connections with the territorial context. It is the same framing in the relevant period and

territorial context that helps to assess the original characteristics and the multiple needs for adaptation.

In 2013 in Italy, the National Council of Architects, Planners, Landscapers and Conservators stressed the need for a “National program for cities under the banner of Sustainable Urban Regeneration” that leverages energy efficiency towards a strategy for environmental sustainability; pointing out that the Italian building heritage “is in an advanced stage of deterioration and de-valorization” as 70% of Italian buildings, private and public, built between 1945 and 1980s of life “are real energy and water “sieves”.

The campaigns of experimental investigations aimed at achieving an adequate level of knowledge on the entire historical system with the deepening of aspects that deserve a higher level of detail with visual assays (scouring, coring and endoscopy) and the use of all devices and techniques that are needed such as double flat jacks or tests on mortars. In order to achieve the necessary adjustments and structural improvements in seismic areas, accelerometer stations are essential in the area to know the physical and mechanical characteristics of the subsoil and foundation so as to achieve a good knowledge of the dynamic characteristics of these phenomena. Only through the data obtained, for health structures in historic-monumental buildings, read also through the interpretation of the historical-critical investigation, is it possible to highlight the presence of any masonry different in type and quality, nature and mechanical characteristics, in order to obtain an accurate modelling of the whole. The improvement of the energy performance of historic hospitals sometimes requires changes in the architectural structure that, if not carefully designed on the basis of a proper energy diagnosis, can also lead to problems ranging from undermining the monumental value and/or documentary artifact up to questioning the static safety of the building itself. It follows that the thermo-technical designer who has to intervene on a historic building, especially if bound by Legislative Decree 42/2004, is often required to acquire the necessary documentation to the knowledge of the building not only for the technical aspects of its competence, but also for those related to the role that building plays in the history of man and within the urban and landscape context in which it is inserted. The energy diagnosis of a historic building is not a simple process. Unless archival research is carried out, it is not possible to go back to the original building and any modifications it has undergone over the years or centuries. From the point of view of materials, it is sometimes possible to trace the stratigraphy of the walls in a non-destructive or intrusive way, for example by using endoscopic techniques applied to pre-existing passages or interstices in the masonry. These techniques, however, could be expensive and in any case do not always give

an account of interventions undergone over time by the masonry, which are often hidden under plaster more or less valuable and that are not always detectable with techniques such as infrared thermography.

2.1 Adaptive reuses on cultural heritage

Adaptive reuse must take into account the categories and concepts of minimal invasiveness, flexibility, reversibility, sustainability, and feedback, so that abandoned places can be revived to new life, always compatible, however, with the geometric, distributive, and spatial characteristics of the edifices and/or complexes to be redeveloped and enhanced.

Preserving and enhancing cultural heritage is not an easy task. Several issues appear, and a holistic approach is needed. In the case of disused heritage buildings, adaptive reuse is a strategy preferable to restoration, preservation, even rehabilitation (Elsorady, 2014).

Adaptive reuse is defined as an excellent way to create valuable community resources from underused properties, to substantially reduce land acquisition and construction costs, to revitalize existing neighborhoods, and to help control sprawl (Vizzarri, 2020). With the goal of enhancing the connection with the outstanding community, adaptive reuse has the capacity to provide adaptation works to the heritage building with the preservation and restoration of its internal and external framework and exclusive features (Cantacuzino, 1989; Coryel, 2005).

When an adaptive reuse strategy for a heritage building is considered, several aspects are concerned regarding the building itself, its users, and its relationship to the community. These aspects involve architectural integrity, public perception, form, new function, and sustainable adaptation.

For the best preservation of historical buildings, understanding of the building, finding, and exploiting its positive values are crucial aspects. In these terms, the appreciation of the architectural integrity undergoes an appropriate judgment regarding the compatibility of design, with the definition of appropriate degree of change. Form and physical characteristics should be preserved to guarantee that the public perception of the building, as a heritage symbol for the community, is not ruined. All these measures have the goal of recuperating the original aspect of the building itself, contributing to a reduced impact in meeting new reuse requirements.

Adaptive reuse processes prove to be successful when stakeholders and community awareness are involved. Because adaptive reuse requires an adaptation to the

current needs of a community, it can often be more labour intensive and it entails significant social benefits, such as job creation, the sense of place factor, and crime reduction (Rypkema and Wiehagen, 2000).

For the success of adaptive reuse initiatives on heritage buildings, use compatibility evaluation becomes a key aspect measuring the impact of new user's requirements. Such evaluation entails on one hand the needs of the buildings, its limitations, and potentialities, and on the other hand people expectation of the new functions (Konsta, 2019).

Compatibility of new uses evaluates the impact of a new project on the built heritage. New performances based on safety, accessibility, wellbeing evaluations are considered together with the related impacts, and the material losses for the transformation works. External relationships and internal features of the modified buildings itself (Di Battista et al., 1995), quantitative impact of the project on the building (Morandotti, 2018), environmental impacts (Chiovaro, 1995) help in considering the impact of the new function on the heritage buildings and its neighborhood. Another important aspect when adaptive reuse is considered concerns the evaluation of ongoing conditions of heritage buildings in use. Such aspect is related to user's behaviours and specifically to visitor's use and carrying capacity structures can support to preserve their specific features.

What comes out from the review on adaptive reuse of cultural heritage buildings is that specific interventions should be carefully considered analysing the flexibility of the structure and the compatibility of the new functions in relationship with the goal of not altering public perception of the building, its specific cultural, architectural, and structural features, and considering the impact of future visitors of the reused building. An in-deep analysis of historical building technologies and constructive techniques may help for the fulfilment of such objectives.

3. Methodology about the recovery of abandoned historical cultural heritage buildings and their reuse in terms of new functions

The starting point of any adaptation and enhancement project cannot fail to take into account the geometric, distributive, and spatial characteristics of abandoned buildings and places, as well as their history and their transformations over time (expansions, additions, elevations, partial and/or total demolitions, etc.)

The reuse of historical Neapolitan hospitals is based on a general methodological approach related to the reuse of historical buildings.

The methodology follows a clear target, namely the recovery of abandoned historical cultural heritage buildings and their reuse in terms of new functions useful for the enhancement of the health care network. To reach such an objective, an integrated approach is developed. First, an in-deep study investigation campaign is needed, providing useful information on several aspects. Main issues investigated are: urban connections of the ancient buildings with the surroundings; reconstruction of the construction evolution; detection and definition of valuable components that need preservation; typological consistencies and layout distribution analysis; constructive and technological investigations. Once a comprehensive knowledge concerning the building physical characteristics is reached, it is possible to define possible guidelines for future reuses. Such guidelines are based on the definition of urban and pedestrian paths connecting internal spaces with the surroundings, the definition of compatible uses, and the definition of technological interventions based on an integrated seismic/energy retrofitting.

In the case of the regeneration of monumental hospitals, guidelines are focused on the recovery and the reuse of disused cultural heritage buildings, based on constructive and technological strategies and new architectural layout compatible with the original typological organization, and on the definition of new functions, compatible with the building itself, useful for the enhancement of the healthcare community services. No longer immense citadels of the health, but places close to the needs of citizens, characterized by a patient-centered vision, such as hospices (Garda, Gerbi, Lippolis et al., 2008), community hospitals, rehabilitation centers and widespread structures that provide services within the gap created between the hospital care, those of emergencies and acute cases, and home care. In the contemporary pandemic context the presence of structures close to citizens' needs could ensure a better management of the health risk, the continuity of care, monitoring the health status of the population and the performance of treatments and protocols (Diana, Marmo, Polverino, 2020).

3.1 The concept of light reuse

Light reuse intersects inextricably with the concepts of adaptive reuse, which means flexibility, reversibility, sustainability, and feedback, so that abandoned places can be revived to new life, always compatible, however, with the geometric, distributive, and spatial characteristics

of the buildings and/or complexes to be redeveloped and enhanced.

These monumental hospitals can host low-care and social care functions. In this sense, some regions are also moving towards reorganising the network of social and health structures, in which monumental hospitals are going to include intermediate social and health activities.

In this rethinking, monumental hospitals - no longer able to meet the needs of contemporary hospitals - could be transformed. They can maintain the prerogative to provide healthcare services, in terms of intermediate facilities, which are low-tech functions, close to basic medicine.

This type of rearrangement, so to speak "light", would keep these structures in the functional field that they have always covered, the healthcare sector. A slight renovation does not need profound upheavals and related negative impacts, respecting and enhancing the existing qualities and peculiarities of architectures.

Urban regeneration refers to a series of actions, not limited to physical aspects, necessary to renovate the degraded parts of existing cities, through endemic processes, aimed at intelligent, sustainable and above all inclusive development (Toledo Declaration, 2010).

"This multilateral and complex approach refers to an integrated and cross-sectoral policy action promoted by a public entity, in partnership with private entities, aimed at the overall, lasting and holistic recovery of an urban area degraded in its physical-environmental, economic and social components".

Historical hospitals thus become the engine of urban regeneration processes declined as the physical redevelopment of buildings and their open spaces. The reactivation of the valuable areas of monumental hospitals would make usable and available large pieces of cities, otherwise in disuse, defining new public spaces with high historical, artistic, and environmental values.

The merely typological and constructive characters must be analyzed together with those related to the urban context (Matteraglia, 2020).

This compatibility study is needed to estimate the real impact of the transformation process (Boaga, 1995). A new use, although in the same functional context as the original (think for example of the transition from a traditional hospital to a clinic), must in fact be compatible with the typological system, the static scheme of the structure, the

protection of its valuable elements and the relationships and flows determined over the years with the context.

There are in current literature several tools able to provide methods of evaluation of the qualities of healthcare facilities (Mısırlısoy & Günçe, 2016) which could provide interesting indications about possible reconversions.

A virtuous example of a monumental hospital's regeneration is that related to the project of SS. Giovanni e Paolo in Venice in which the specialist departments will be concentrated in newly built pavilions, while the two ancient convents will be converted into intermediate care facilities (community hospital and territorial rehabilitation unit). This guarantees the possibility of allocating the areas close to the nearby Scuola Grande di San Marco, a historical medical library and the main entrance to the hospital, to the activities of the library itself, in a logic of enhancement and use of the spaces from the citizens (Alalouch et al., 2016).

3.2 Integrated approach: the need for structural and energy retrofit and the redefinition of the architectural layout

The vulnerability and fragility of the historical heritage is high and there is a need to identify and implement strategies for seismic risk adaptation and mitigation. The problem of assessing the performance of historic buildings began to be addressed rigorously only after earthquakes, for example in Italy after the 1970s earthquake in Friuli and the 1980 Irpinia earthquake. The awareness acquired and the evaluation of masonry buildings highlighted the importance of conservation and the need for collaboration between the professionals involved in the safety and conservation of the historical heritage but belonging to different disciplinary fields, such as structural engineering, energy, restoration and architecture.

The valorisation and reuse of monumental hospitals allow the architectural, structural and monumental aspects of these factories to acquire new life while performing essential functions for the community.

The purpose of integrated retrofit interventions on historical hospitals is to promote the continuation of a social function like the historical one but at the same time to protect the buildings in its valuable elements and components. Neapolitan monumental hospitals are often located in highly urbanized contexts, in the historical center, in the heart of the city and present problems of accessibility and viability. In most cases, these monumental complexes, originally monastic or conventual, have structural characteristic which can limit the flexibility

of use in defining new architectural layouts. However, it is possible to demonstrate that the architectural layout and consistency of this building type fit the functional regeneration into community healthcare services in line with the light reuse concept. The following sections provide case studies to support the statement.

4. Purposes and processes of complete resettlement in abandoned structures: case studies

The goal of achieving the complete resettlement of industry workers and city users in these abandoned complexes and buildings is the primary objective to be implemented through a rigorous and multidisciplinary methodology.

A common thread links some hospitals and health facilities in Naples: being an integral part of the historic center of the Neapolitan city and being buildings of great architectural value with complex layouts. In many cases, the original typological and distributive characteristics have been altered during the centuries. They were built over the centuries when there was no awareness, no sensitivity, and no norms for the protection of the historical and artistic heritage.

However, their presence in the city represents an added value. The specific function of health care, hospital and services are performed in places that are dripping with history, places that have seen the birth and growth of real Schools of Medicine, have seen work together with health care personnel, parasanitary and administrative even illustrious names, luminaries and scientists of medicine that have made the history of the discipline and the city.

As an example, three historical hospitals have been analyzed: the Hospital SS. Annunziata, the former Conventual Complex and the former Presidio Ospedaliero Gesù e Maria, and the former Presidio Ospedaliero San Gennaro extra moenia (Figure 4).

The SS. Annunziata Hospital was erected in 14th Century simultaneously with the adjoining church, convent, hospice for orphans and housing for single mothers. In the complex, famous is the "wheel of the exposed", still visited: a hole through which babies were abandoned by their mothers out of poverty or because they were illegitimate (Marino, 2014). The hospital of the SS. Annunziata is a complex four-story building originated by continuous additions. It can be defined a "palimpsest" in its meaning of an ancient manuscript, whose original text has been erased and substituted by another one

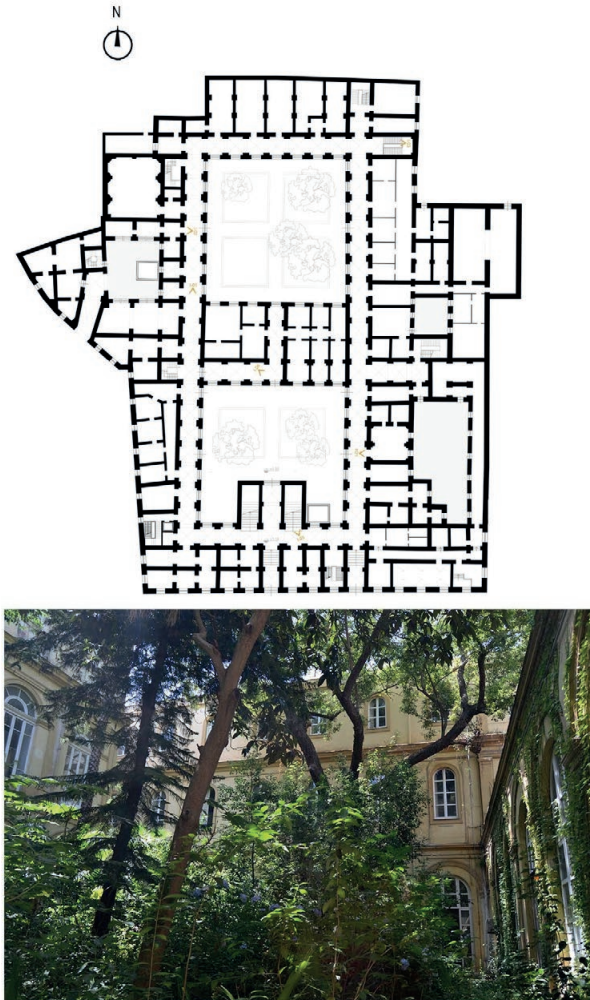


Figure 4 | a) Plan and photos of the Monumental Hospital Gesù e Maria.

arranged in the same direction. This underlines the overlapping of several interventions which followed one another during centuries until the end of the 19th Century, when with the Restoration interventions and the construction of Corso Umberto, a part of the building was demolished. This operation implied the need to cover with a scenic facade the openings that had been created on the secondary Renaissance internal courts. Nowadays the building is partially disused, and several stories are abandoned.

The former Gesù and Maria Hospital was constructed as a convent during the 17th Century and underwent a heavy intervention of transformation to host the hospital function around 1865 by the engineer Federico Travaglini (Picone, 1996). The transformation was based on several interventions: the changing of the main facade; the

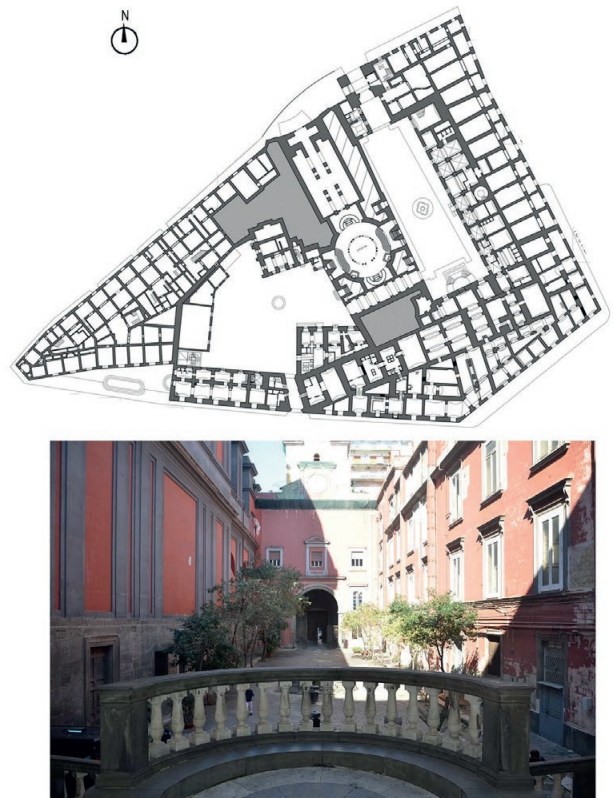


Figure 4 | b) Plan and photos of the Monumental Hospital of Annunziata.

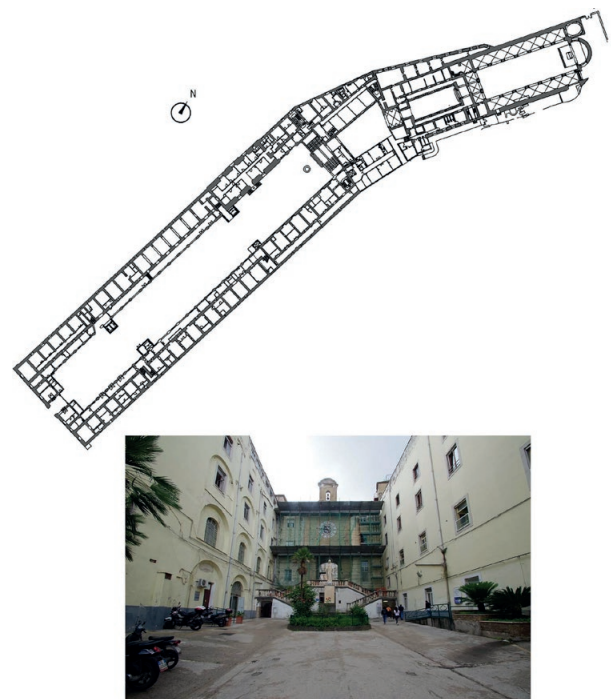


Figure 4 | c) Plan and photos of the Monumental Hospital San Gennaro of Poveri.

addition of further vertical connections; the creation of large rooms in place of the monastic cells; the closure of the portico around the cloister; the separation of the original cloister into two distinct courts by the addition of a central volume. Nowadays the structure is completely abandoned and disused.

The San Gennaro Hospital has a compact shape: a double wing building organized around the succession of three courtyards. The hospital, as an enlargement of the original convent, was built in 1656, following the devastating plague epidemic. The first courtyard develops from the south entrance for a considerable length with two orders of sixteen arches, today closed, and two orders of simple windows. The second courtyard, smaller than the first, has an entrance hall covered by a barrel vault full of frescos. The third courtyard, the smallest one in size, is directly referred to the church of San Gennaro with its main façade on the north side. In the case of San Gennaro hospital, analyzing historical maps, it is possible to stress how the city structures and infrastructures developed around the hospital itself. Nowadays the hospital is partially abandoned and meant for transformation of same wards into a community hospital.

Even though they are different for plant characteristics, some recurring elements allow a transversal typological reading. All three cases present a central open space around which the structures are distributed. In the Annunziata hospital there are two courtyards connected by a covered walkway; in the Gesù and Maria hospital, there are two central green cloisters; in the San Gennaro hospital there are three linear courtyards. These spaces have a strong artistic and environmental value, for the presence of valuable artistic and architectural works or gardens.

Their structures are in masonry with yellow tuff mainly for a number of floors of three over the first. They are the result of a continuous sedimentation and evolution of interventions, demolitions, additions, elevations, insertions of new vertical connections (stairs, elevators and freight elevators). In all three cases, as in many other situations, we are witnessing functional adaptations (dormitories for inpatients, doctors' offices, surgeries, operating rooms, etc.) or significant and invasive new distributions.

5. Results and discussion of resettlement in formerly uninhabited and now valued places

Complex processes of redevelopment of disused and abandoned places such as historic monumental hospitals are closely linked to urban regeneration policies.

In such processes, the consumption of new land is reduced and appropriate and sustainable choices for the redevelopment of the existing historic building stock are promoted.

The structures of Figure 4 have different architectural layouts even though the three of them are based on the same masonry tuff structure. The evaluation of the transformability and the flexibility of the existing structure is at the base of the regeneration interventions proposed, as analysed by Diana et al. (2022) on the same case studies. In the general plan of regeneration of the regional health care system, the Annunziata Hospital is meant to host a listening center for women and a counselling center, together with a pediatric complex of primary care and a pediatric community hospital. The general reuse of the structure aims to reopen the inner courtyards to the city flows, both in terms of access to health functions and for a simple urban crossing. The width of the building body of the existing wings (more than 10 m) allows, with regard to the ward design of the community hospital, the inclusion of the scheme room+corridor+room as illustrated in Figure 5. The width of the structure allows even the addition of an internal insulation layers without essentially reducing the surface of hospital rooms.

In the Gesù and Maria case study, the big rooms ("stanconi") realized during the 19th Century intervention provide a greater freedom in terms of new layout definition. Such a higher transformability brings to the definition of a residential function for patients with mental problems at the second floor based on the addition of small shared apartments (two person rooms with private bathrooms and shared living) (Figure 6). In addition to the residential structure, a complex of primary care is added together with a bar and a fast food in the volume at the center of the cloister. In this way, the first court would be used both as an access path to the health functions and to the bar itself. The second courtyard remains as a more private and secluded place, useful exclusively by the patients of the residential structure. Entering more in the details of building choices, it is proposed to reopen the original portico, restoring the original arches and plugging them with full-height windows.

In the San Gennaro hospital, the three internal courtyards of the complex are reopened to urban flows, ensuring again the entrance to the church of San Gennaro from the third courtyard and no longer from the outside of the hospital complex. Consequently, visitors to the church must necessarily walk through the three courtyards of the complex. From a functional point of view, a hospice, a community hospital and a polyclinic section are inserted in the large spaces of the monumental hospital. The transformability of the building is limited by the reduced

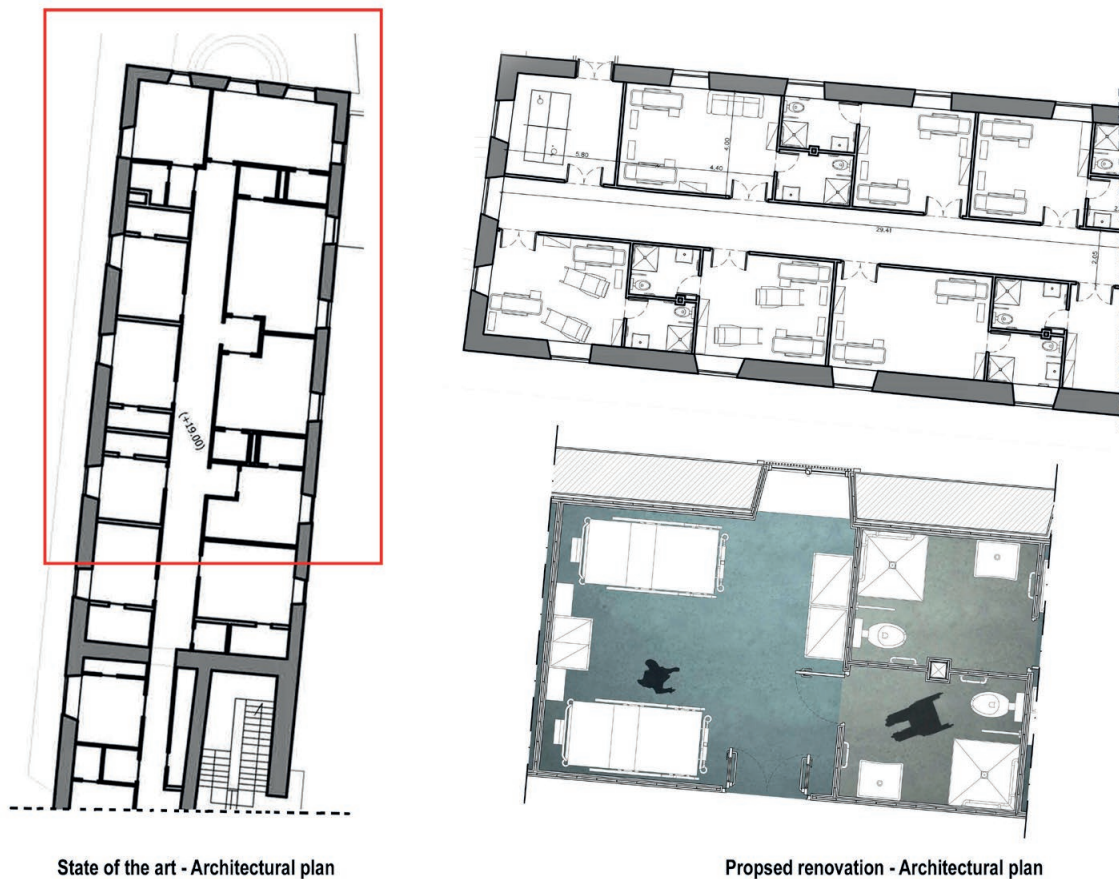


Figure 5 | Anunziata's architectural plans.

width of the structure. Therefore, a simple room + corridor scheme can be proposed for all the new services and functions considered (Figure 7).

The structural seismic adaptation or the simple structural improvement (when it is not objectively and technically possible the adaptation) implies a detailed knowledge of the geometry and the dimensional data of the wall faces for each level, as well as the detailed knowledge of the materials (masonry in limestone, in yellow or grey tuff, in bricks, etc... including the mortars), of the building system in general as well as of the single building elements. (Cosenza, Prota, Di Ludovico, Del Vecchio, 2017. "Il metodo convenzionale per classificare il rischio sismico delle costruzioni", *Costruire in laterizio*, N. 171).

A decisive role is also played by the knowledge of the state of use, the conditions in which the works are located and the level of maintenance. In addition to the dimensional and architectural survey, the material survey

and the knowledge of the conditions in which all materials are found is of primary importance. Intervenes then diagnostics, preferably non-invasive, aimed at knowing the expected performance of the individual parts and the work in general (Moroni, 2017- "Classificazione del rischio sismico degli edifici: il calcolo, i rischi e le sfide" -web site: ingegno-web.it del 23/03/2017).

The structures are compact and their structural behavior for this reason makes them less vulnerable. Being compact, they do not require invasive interventions, in fact, the conservative restoration, provided for the recovery and enhancement of monumental complexes, have the primary objective of protecting a building that, since its foundation, has been deputed to be a place of hospitalization, diagnosis and care. Preserving at the same time the natural vocation of the building but, preserving, in a substantial way, also the sanitary destination. For this purpose, the objective is (with reference to all current legislation and in particular to the D.G.R.C. n. 7301/2001)

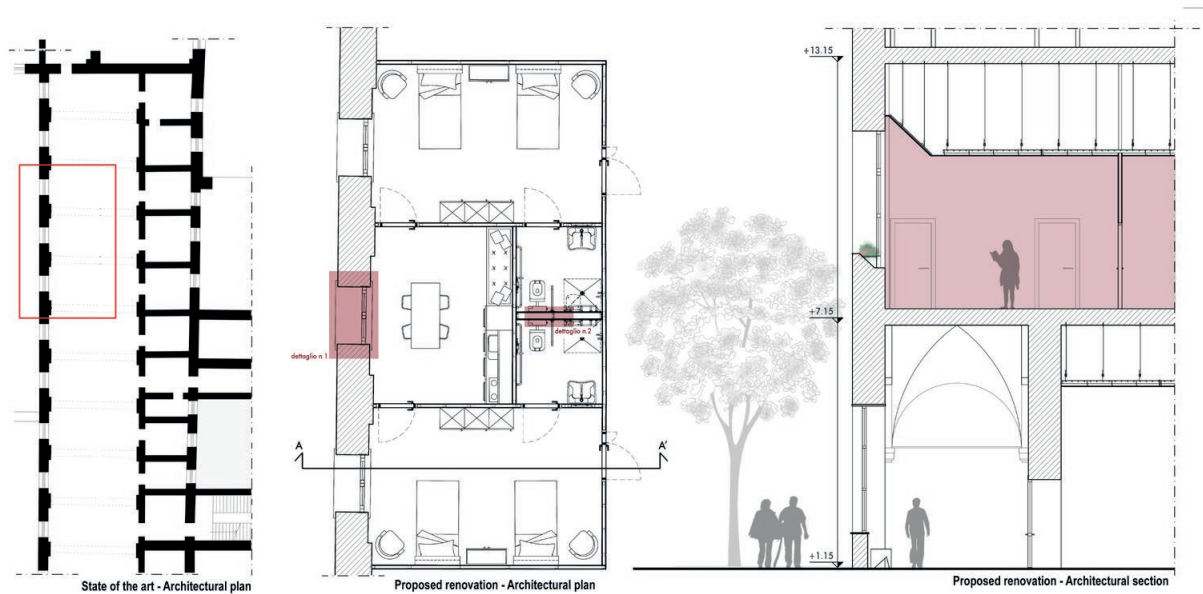


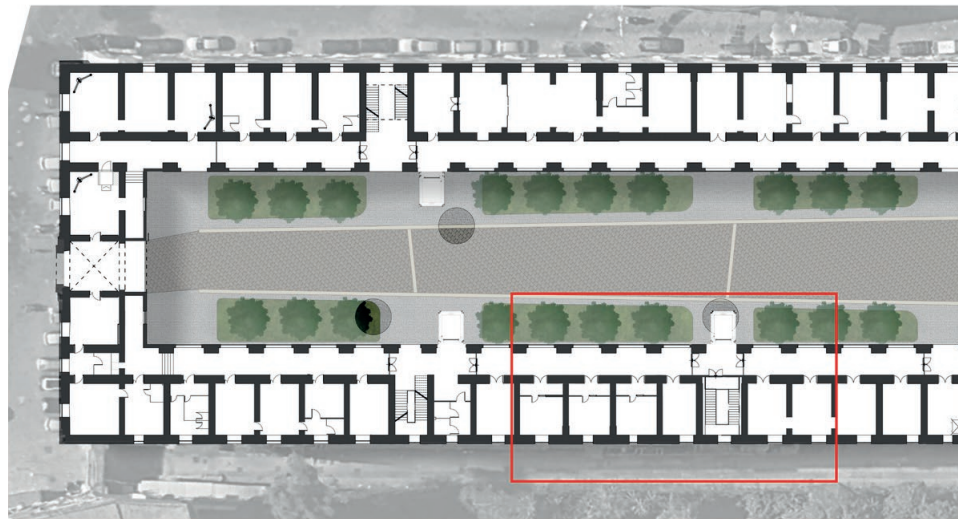
Figure 6 | Gesù and Maria's architectural plans and section.

the creation of Integrated Multidisciplinary Facilities such as: rehabilitation, community hospital, long term care, Alzheimer's and dementia day care center, therapeutic garden, specialist outpatient clinic, laboratory medicine, diagnostic imaging, support services, accommodation outdoor areas.

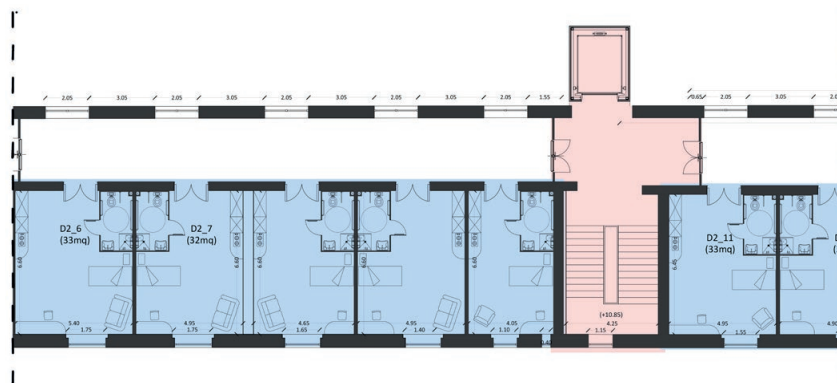
Similarly, the energy retrofit is required today for any intervention of reuse, redevelopment, adaptation of building artifacts. Energy issues have become increasingly important in building processes, until a few years ago to list the best energy classes and desired for both interventions on existing buildings, both for new interventions. The climatic conditions, the detailed knowledge of the buildings, the intended use, the physical-mechanical characteristics and the energy performance of individual materials are all factors involved in the energy retrofit. In this case, it is impossible to pre-determine a priori the process of intervention because each building has a history and limitations and constraints that prevent certain choices, or lead to other choices, or at least do not put in a position to achieve the "ideal intervention". For example, perhaps trivial, it is certainly not possible to make an external coating to a stone masonry or brick face, nor to a building rich in friezes, cornices, pilasters and capitals. Any intervention that is not respectful of the original characteristics, even formal and linguistic, cannot and should not be taken into account. At this point, it will be possible to think of intervening from the

inside using, for example, thermal plaster (<https://www.infobuildenergia.it/approfondimenti/efficienza-energetica-delledilizia-storica/#>). Similarly, the technological systems that in new buildings are under trace or travel vertically in special cavities and horizontally in false ceilings or floating floors, these same technological solutions are unthinkable in a historical and artistic artifact. The modern culture of restoration wants these systems to be visible, well readable in copper piping and in any case reversible, removable, easy to inspect and maintain. A key role in all this is played by the skilful coupling of masonry, vaults and historic structures with contemporary metal ducts in copper or steel structures and steel and glass.

The study of energy efficiency to ensure thermal, hygrometric, visual and environmental comfort concerns both the individual components of the building envelope, and the system as a whole; but the main critical issues that monumental complexes present are due to the constrained facades that the pre-existences impose, both in terms of architecture and cultural heritage housed in them. Both in terms of urban context, since there are often constraints on the site in the vicinity of the monumental complex, and on the historical building itself. Therefore, the least invasive way to intervene and ensure good energy performance is from the inside through active technological solutions and systems.



State of the art - Architectural plan.



Proposed renovation - Architectural plan.

Figure 7 | San Gennaro's architectural plans.

As is also evident from an excerpt of design proposals for the three monumental complexes under study, a series of interior layout design proposals have been produced to allocate inpatient rooms, specialist and operator rooms, outpatient clinics, etc. While the original masonry layout is to be retained, inside, on the other hand, new distributions have been proposed with prefabricated dry, lightweight, demountable and removable partitions and dividers. Floating floors have been provided so that all the planting can also be easily accessible and maintainable.

6. Conclusions

This work has outlined an approach for the recovery and enhancement for social and cultural purposes of unused and abandoned historical hospitals that positively affects the quality of life of citizens and their sense of belonging;

it could generate new skills, new types of professions and new jobs, also becoming a concrete support for sustainable development.

The paper aimed to:

- develop a constructive and historical analysis of monumental hospitals in order to plan coherent and sustainable retrofitting interventions;
- suggest proposals for regenerating historical hospitals into community and intermediate healthcare facilities;
- implement strategies for seismic risk mitigation, energy consumption reduction and architectural layout redefinition.

Thanks to the historical and technological analysis, it is possible to identify the historical specificities of the artefact in terms of temporal transformations, materials and construction techniques that are the key factors for coherent and sustainable retrofitting interventions.

This paper discusses different case studies of Neapolitan historical hospitals for which regeneration

intervention proposals are made with the goal of strengthening the existing community healthcare system and developing energy efficiency and seismic improvement strategies in the spirit of sustainable development. Leveraging the flexibility of monumental hospitals, the proposed light retrofit interventions restore the historical healthcare functional destination ensuring also the reuse of such an heritage and urban quality improvement.

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