

READING THE PAST: ANALYSIS OF THE IMPACT OF PREVALENT PANDEMICS ON CITIES

Stefania FARINA ^{*}, Camilla MILETO , Fernando VEGAS 

Universitat Politècnica de Valencia, Valencia, Spain

Received 04 May 2023; accepted 26 October 2023

Abstract. Throughout history, dozens of epidemics have appeared cyclically, often causing devastating effects. Some of them, such as plague, cholera, and tuberculosis, have led to significant social, economic, and political consequences, with evident repercussions on cities and architecture. In this regard, urban planning has played an essential role in improving life expectancy and limiting the spread of epidemics. This work aims to study the influence of prevalent pandemics on architecture and urbanism over the centuries to comprehend their response and adaptation to new health and social requirements. Through a process of investigation and in-depth examination of the literature review, it has been possible to understand the impact of pandemics in cities. The appearance of the first preventive measures during the plague period, the urban interventions to combat the cholera outbreak, and the neat architectural features adopted following the appearance of tuberculosis are witnesses to this process. Professionals and academics are reflecting on the challenges of the Covid-19 pandemic, which will affect the practice of architecture and urban design. Thanks to the results obtained, it will be possible to reflect on the impact of the pandemic on contemporary cities, understand their potential resilience and hypothesise future strategies.

Keywords: pandemic, Covid-19, hygienic conditions, plague, cholera, tuberculosis.

Introduction

The Covid-19 pandemic has inevitably changed our lives, forcing us to live indoors, to give up social spaces and green areas. Forced cohabitation in spaces often small or unhealthy, not designed for certain daily activities (work, study, sports, socialising, etc.), has revealed not only the inadequacy of housing but also structural deficiencies in the existing buildings and gaps in legislation. All these aspects have made it vital to rethink the concept of physical and mental well-being.

Professionals and academics are currently reflecting on the challenges to architecture and urbanism highlighted by the coronavirus pandemic. Discussions address possible new ways buildings could help limit the spread of future epidemics. These reflections cover all the scales of design, from interior design and public spaces to surface coverings. But the overall picture is complex. On the one hand, there is the emerging collective demand for air quality, nature and spaces for social interactions. On the other, it has become increasingly difficult to provide answers for a highly individualised

society where even intermediate organisations are losing relevance (Nigrelli, 2021).

However, this is not the first time that humans have come up against these problems. Throughout history, humankind has endured different pandemics and epidemics, which caused millions of deaths. Some of them, such as plague, cholera or tuberculosis, have changed the history of humanity with multiple social, economic and political consequences (González Toapanta, 2021). In this sense, historical research related to their effects is crucial, because reading the past is a fundamental tool to understand the dynamics of adaptation of cities, strategies adopted or mistakes made. The overall objective of this work is to study the effects of pandemics on cities, observing how these were affected and which was their impact on architecture and urbanism. This analysis represents a starting point to reflect on the reconfiguration and adaptation of residential and urban spaces, resulting from the new demands arising during the pandemic.

This is part of a doctoral research about redesigning residential and urban spaces in light of the pandemic emergency.

*Corresponding author. E-mail: stefari@gmail.com

1. Methodology

The research is based on theoretical and documentary studies to determine the types of connections between pandemics, architecture and urbanism over the centuries. The study is divided into three phases: data collection, analysis and data processing.

The data collection phase started with preliminary bibliographic research, thanks to which the most relevant sources were selected. It has been conducted by reading both paper and digital sources or attending conferences and seminars. Many documents have been consulted, such as books, treatises, monographs, essays, ebooks, reports, articles, videos, conference proceedings, journals, etc. Both historical-architectural and medical contents have been examined, given the multidisciplinary of the theme.

The second phase consisted of reviewing and analysing the material collected and selected. This process allowed a more in-depth examination of the impact of pandemics on cities and how these reacted and adapted to the new health and social demands, depending on their specific characteristics. The quantitative methodology identified the historical periods most affected by major pandemics, such as plague, cholera and tuberculosis. For each period, the factors that contributed to their spread and the solutions adopted by the authorities to contain them were identified. The qualitative methodology allowed us to understand the perception of the events, their criticalities, the unresolved aspects and the different points of view. Some interventions, in fact, have triggered deep reflections and conflicting opinions, given the magnitude of their scope.

The last phase consisted of processing the data examined and the relative description of the features, the innovative aspects, the contradictory ones and their consequences on society. Based on the results obtained, it will be possible to hypothesise solutions and strategies for the future, considering the need for both social distancing and lockdown in the event of a new pandemic.

2. Results

Dozens of epidemics and pandemics have characterised the history of man but the major ones, like plague, cholera and tuberculosis, will be analysed below.

2.1. The plague

The plague appeared periodically, as early as the 6th century, establishing itself endemically for 400 years until the 18th century. But the second pandemic, known as the Black Death, was the largest and deadliest of all time, reaching its peak between 1347 and 1353. When the plague arrived, Europe was already in trouble from the famines that affected it following a sudden drop in temperatures in the 14th century. Malnutrition led to a demographic decline and weakening of people, which along with poor hygiene conditions, determined the rapid spread of the disease.

Although the transmission mechanisms were unknown and were only identified in the 19th century, the prevention measures were inspired by the miasmatic humoral theory. It explained the origin of the disease through the spread in the air of poisonous particles and the so-called “miasmas”, putrid exhalations and vapors or gases released by decomposing plant or animal organic matter (Volcy, 2007). Warm, humidity and shady places were considered the ideal environment for its development, evolution and spread (Bonastra, 2000). In addition, the cities of the late Middle Ages had a structure favorable to the contagion: narrow and winding streets; high population density, especially in the poorest neighborhoods; open drains; great proliferation of mice and parasites. In reality, only several centuries later it was discovered that they were the vectors for the spread of the disease, which was transmitted to humans through the fleas contained in their skin.

Until the early 19th century, prevention measures held the need to keep the sick away from the healthy. Consequently, disease control practices were based on isolating people, ports and entire cities (Urquía, 2019). It was precisely in the ports that the fight against plague was concentrated, originated in Central Asia and spread by increased trade between East and West. Given its position and business presence, the city of Venice in Italy represented a crossroads of the trade routes of the Mediterranean. Its geographical configuration inspired the location of the first public hospital for the plague victims, set up on the island of Santa Maria di Nazareth in 1423 and named *Lazzaretto* (Figure 1). The name was perhaps born from merging the word Nazareth with Lazarus, protector of lepers and contagious diseases in general (Malagnini, 2021).

The empirical observation of an incubation period led to reflection on the appearance of epidemics in cities where sick people had not entered. This discovery led to the abolition of a defense based on the total closure of communications of territorial units, replacing it with protection that imposed a temporary barrier to the traffic of people and goods, intended to delay rather than to ban entry (Bonastra, 2010). A period called “quarantine”



Figure 1. Aerial view of the Lazzaretto Vecchio (source: Google Earth, 2022)

was instituted because, in ancient times, according to Hippocratic doctrine, it was believed that there should be 40 days of isolation to ensure that no contagious disease would appear.

From the end of the 14th century, the application of quarantine principles allowed other European cities to move from a defensive paradigm to a preventive one (Bonastra, 2012). The quarantine site had to be closed, like a fortress, to ensure that contact between the inside and the outside would not be possible. Special attention was paid to the arrangement and ventilation of the rooms. A strict segregation of persons and goods was also applied within the enclosure (Bonastra, 2010).

The Black Death profoundly altered the economic and social foundations of the Old World, thus representing the symbolic psychological decline of the European Middle Ages and giving way to the first manifestations of the European Renaissance.

Between 1484 and 1485, Leonardo da Vinci (1452–1519) moved to Milan, where he witnessed the terrible plague epidemic that decimated the city and forced the demolition of many buildings where the contagions had occurred. He realized the plague was spreading due to unsanitary living conditions (Isaacson, 2018), but hygiene was not the only problem. The transportation of goods was complicated due to its irregular planimetric distribution, which favored the traffic, and the construction density was increasing. Thus, he began to deal with urban renewal by proposing a project for an “ideal city” (Figure 2).

The model proposed a radical concept, which should be functional, efficient and clean, planned for well-being and beauty. He thought of an open city, without retaining walls, based on a modern and rational urban model. It was defined by arcaded streets, wide and open spaces to house public life and public and private buildings, characterized by aesthetically pleasing architecture but always regulated by functionality. He also planned an underground network of canals directly connected with buildings to facilitate sewage evacuation and a system of hydraulic pumps that would have allowed the water not to stagnate.

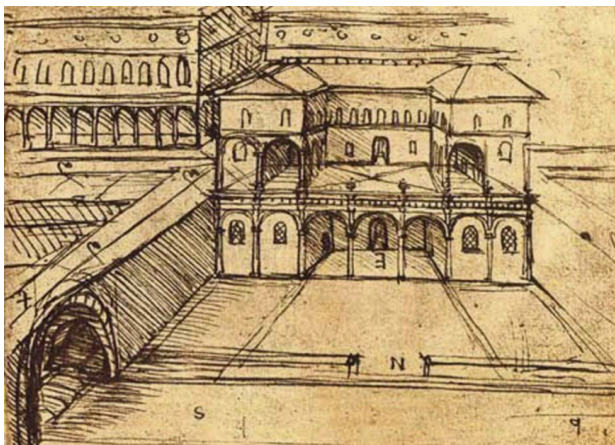


Figure 2. Drawing of the “ideal city”

His conception was revolutionary in urban renewal and hygiene and would have represented a breakthrough in the 15th century, but it was not realized. Anyway, it influenced the recurring theme of the “ideal city” of the Renaissance period, based on the principles of rationality and functionality as opposed to the urban overpopulation of the Middle Ages.

2.2. The cholera

From 1820, when it first arrived in the Mediterranean, cholera appeared cyclically in several seasonal waves for about 100 years. Although the transmission mode was still unknown, the most common belief was that cholera resulted from impure air and that any decaying or foul-smelling organic matter, such as corpses, rotting vegetation or human effluents, produced disease and was potentially fatal. Only towards the end of the century it was discovered that it was related to the contamination of the water and was caused by a bacillus, the *Vibrio cholerae*, located in the gastrointestinal tract. It was first identified in 1854 by the Italian anatomist Filippo Pacini (1812–1883), who gave it the name, and studied in detail in 1884 by the German physician Robert Koch (1843–1910).

At that time, cities were the result of the economic and productive transformations of the Industrial Revolution of the last decades of the 18th century, which occurred first in England and then in the rest of the world, giving them a new spatial configuration. The *industrial cities* were divided into different zones, formed by the *center*, the oldest part of the city with bourgeois residential buildings and their services, and the *periphery*, much wider than the center and composed of factories and public housing. The overcrowding and the poor sanitary conditions characterised these workers’ suburbs: the houses were all piled up, usually semi-detached, small and too close to the factories, which covered them with dust and polluted the canals with their toxic fumes (Engels, 1845). A correlation was established between the spread of cholera, which was predominant among the poorer residents, and the sanitary and hygienic conditions in which they lived.

Violent epidemics which decimated European cities led to the execution of urban transformations (Sánchez de Juan, 2000), which were possible thanks to important technological revolutions. Examples of cities such as Paris, Barcelona and Naples showed an attempt to implement urban regeneration strategies.

2.2.1. Paris, Grand Travaux

When cholera arrived in France, in 1832, Paris was a medieval city of narrow streets, crowded houses and poor sanitary conditions, perennially inflicted with epidemics and insurrections.

The emperor Napoleon III promoted an urban renewal called *Grands Travaux* and assigned their coordination to the Prefect of the Seine, Baron Haussmann. He carried out a massive and radical urban modernisation, driven by hygienist, social, strategic and economic reasons, which



Figure 3. Aerial view of Paris (source: Google Earth, 2022)

made it one of the most significant urban developments of the 19th century (Quijano Ramos, 2011). The plan was developed continuously from 1852 to 1870, gutting the dense fabric of the ancient city and building new wide, rectilinear, tree-lined streets adapted to troop movements.

Several interventions were carried out:

- the demolition of the old neighborhoods and the displacement of thousands of poor inhabitants to the periphery;
- the construction of the two main north-south and east-west roads and the ring of boulevards;
- a large number of public and private buildings (schools, hospitals, barracks);
- primary infrastructures (aqueduct, sewerage, gas lighting);
- transport infrastructures (bridges over the Seine, train stations);
- public parks (Bois de Boulogne to the west and Bois de Vincennes to the east);
- the annexation of peripheral municipalities.

Although Haussmann's plan was criticised for the intensity of the interventions, it improved the quality of life in Paris (Figure 3). Major epidemics (but not tuberculosis) disappeared and the quality of new buildings improved, as did road traffic (Quijano Ramos, 2011).

2.2.2. Barcelona, Plan Cerdá

Barcelona also suffered different epidemics, most notably, three waves of cholera around 1850. In that period, it was a walled city with a high population density; made up of narrow streets; with little sunlight; humid and poorly ventilated; with problems of overcrowding and public health. After the demolition of the walls (1854), the Ministry of Public Works assigned the task of drawing up an urban expansion plan to the engineer Ildefonso Cerdá (1815–1876). The Plan Cerdá was a plan of reform and expansion, with a structure based on an open and egalitarian grid. It foresaw opening at least three major streets in the city center, intending to connect the expansion, the port and the old city in the same circulatory scheme. The hygiene principles, urban circulation and an equitable territorial policy inspired it. He designed a continuous grid of hous-



Figure 4. Aerial view of Barcelona (source: Google Earth, 2023)

ing squared blocks, aggregated according to a geometric pattern (Sennett, 2019). The grid measured 113.3 meters, with streets 20, 30 and 60 meters long and a maximum construction height of 16 meters. The innovation was that the blocks had 45° chamfers for better visibility (Figure 4).

The city was thus composed of:

- neighborhoods (25 blocks, 1 school, 1 church and 1 barrack);
- districts (4 neighborhoods and 1 market);
- sectors (4 districts, 2 urban parks, 1 hospital, administrative buildings and industries).

The building capacity was initially planned on two sides of the block, in various possible combinations. But, over time, the plan underwent different transformations and many of its guidelines were not applied, as speculation and the interests of the landowners distorted the Cerdá plan (García-Ayllón Veintimilla, 2014). The plan was therefore unable to make the socialist objective of a more egalitarian city a reality.

2.2.3. Naples, the rehabilitation

The severe cholera epidemic in Naples in 1884 highlighted the urgency of an effective rehabilitation intervention (Manzo, 2018), which the government promoted. This action aimed to reduce housing congestion; demolish unhealthy areas; construct new expansion districts and social housing; new infrastructures; and an efficient sewerage and water distribution system.

The sanitation plan required extensive demolition and reconstruction in areas, as it had in Paris. The significant urban intervention radically transformed the appearance of the heart of the historic center, through an operation known as “gutting” (Figure 5). In some cases, buildings of great historical or artistic value were demolished to allow the implementation of the plan.

The first sanitation law, “*Legge per il risanamento della città di Napoli*”, also appeared, contemplating the right to property for social purposes for the first time. The law, born to meet health needs, was a fundamental landmark

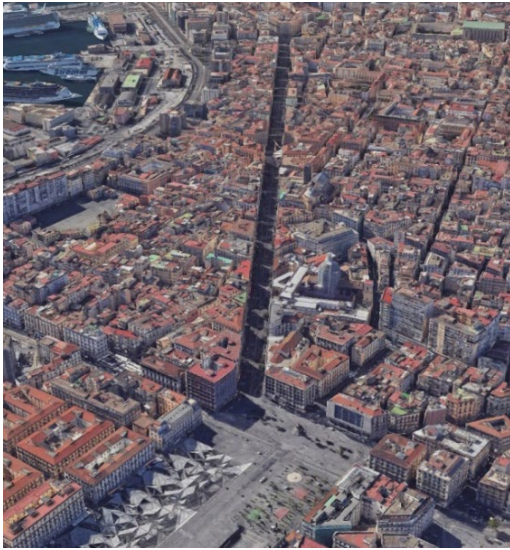


Figure 5. Aerial view of Naples (source: Google Earth, 2023)

for urban legislation on the subject of expropriation and calculation of compensation (Sánchez de Juan, 2000).

In reality, behind the great palaces, the situation remained unchanged, simply masking the degradation of the poorer neighborhoods instead of solving their problems.

2.3. The tuberculosis

At the end of the 19th century, the tuberculosis epidemic affected all social classes indistinctly. Regarding the mode of contagion, for decades the belief of transmission by dirty air prevailed, based on the miasmatic theory that the disease spread by contact with air. It was not until 1882 that the German physician and microbiologist Robert Koch (1843–1910) identified and described the bacterium that causes it, *Mycobacterium tuberculosis*, for which he received the Nobel Prize for Medicine in 1905. The discovery revealed that the disease was infectious¹ and survived in the darkest and dustiest places, so the sun, clean air and rest improved the patient's health.

The impact on architecture was considerable and began with the active collaboration between architects and

physicians in the design of sanatoriums for TBC (Colomina, 2021). Sun, light, ventilation, exercise, rooftop terraces, hygiene and whiteness were offered as tools to prevent, and even cure, tuberculosis (Mumford, 2012). Outdoor schools, called anti-tuberculosis, also appeared. Concrete and glass became the key elements of the new structures for both hospitals and schools (Del Cueto, 2021).

The *Paimio Sanatorium* (1929–1933) by Alvar Aalto (1898–1976) is a true icon of the 20th century, intertwining modern design and functional needs (Figure 6). It is characterised by rooms with simple lines, without ornament, to minimise the surfaces on which dust could accumulate.

Its design was conditioned by the requirement of patients to remain to lie in bed. Light sources were placed outside the field of vision not to irritate the eyes, heating was oriented towards the feet, and tap water ran quietly to prevent patients from bothering their neighbors. Above the wooded landscape, the roof terrace provided a space for patients to take their regular doses of fresh air and sun on deckchairs specially designed by his wife Aino. The colors were selected according to the sensation they conveyed: shades of relaxing blue for the ceiling and lighter ones for the walls; yellow in the lobby, corridors and stairs, to evoke optimism.

The focus then shifted to the houses, which were considered sick. The great architects aimed to create healing environments, physically and symbolically clean of diseases and pollution. Therefore, they began to build white buildings with large windows and terraces for sunbathing and exercise. The minimalist design furniture replaced the carved wood and upholstery, and lightweight and washable materials and aerodynamic shapes were used. Wooden floors were replaced by tiles or linoleum.

Le Corbusier (1887–1965) believed that the houses had to be raised from the ground with *pilotis* (stilts) as wet soil was a breeding ground for disease. *Ville Savoye* (1929–1931) was painted a stark clinical white, with rooms suspended on *pilotis*, full length windows and a terrace garden.

Richard Neutra (1892–1970) thought that the function of the house was to offer not only physical health but

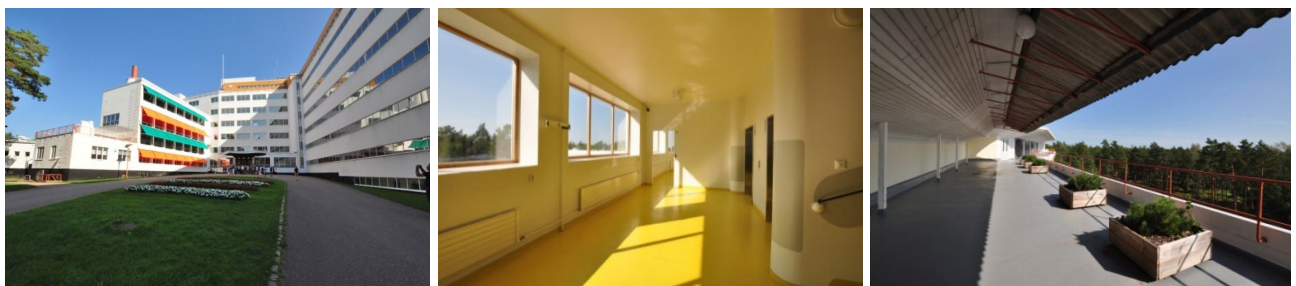


Figure 6. The Paimio Sanatorium (source: Caruso, 2019. Reprinted with permission)

¹ Transmission occurs via the air, through saliva droplets or bronchial secretions, by simple coughing or sneezing. The incubation period is from 8 weeks to a lifetime.

also psychological well-being. *Lovell House* (1927–1929) was the result of a collaboration between the architect and doctor Philip Lovell.

Mies Van der Rohe (1886–1969) designed *Tugendhat House* (1929–1930). The façade featured full-height glazing and a disappearance mechanism that made this house permeable. All the flooring, except for the entrance, was in natural linoleum.

3. Discussion and interpretation of results obtained

Diseases are a constant presence in the history of humanity and an ongoing concern for architecture and urbanism, which have always played a key role in the fight against pandemics. Because the first protection strategies, in the absence of adequate care systems, were implemented in cities. Despite the lack of scientific data, cities reacted as best they could. During the Black Plague period, the configuration of the spaces initially pursued the logic of isolation, according to the most accredited hypotheses of the time that saw in miasmatic theory the principle of propagation of infirmity. Then the cities moved from a defensive paradigm to a preventive one. The first case provided for total isolation by prohibiting any transit from the city, both incoming and outgoing of people and goods. While the second applied a continuous protection system, requiring constant monitoring and strict surveillance measures, with a configuration that referred to the prison organization (Bonastra, 2012). The effects of pestilence also influenced architecture. The structures became more austere, reflecting the widespread pessimism of the time and the concern for death (Cantor, 2001).

The social and economic consequences of the huge demographic decline significantly influenced the historical evolution of society. The question of its effects has long animated the historiographical debate, which derived different methodological approaches². In line with the last reading, late medieval Europe would have gone through a phase of relative economic decline. Essentially, the decline of one region or a productive sector would have been compensated by the transformation/reconversion of some sectors of the economy, capable of reactivating, although with different times and modes, the circuits of production and exchange (Petracca, 2022). The ensuing political and social destabilization gave way to the first manifestations of the European Renaissance. The recurring theme was

that of the “ideal city”, which reflected the principles of rationality and functionality as opposed to the overcrowding of the Middle Ages. But Renaissance architecture summed up the typical limits of Renaissance design, which could theoretically be applied to any type of city and territory but did not produce significant urban transformations in practice. Its ideal principles of proportion and regularity were used only in some isolated buildings (ornamental systematization and design of representative spaces), with partial modifications in the city’s fabric (Benevolo, 1972).

The violent cholera outbreaks decimated European cities, spurring subsequent urban transformations through major technological revolutions (Sánchez de Juan, 2000). These included the construction of sewerage and water supply networks, the expansion of streets and squares, new zoning of the metropolitan territory, the definition of the performance that each living environment should guarantee, and more specialized sanitary infrastructure. Each service had to correspond to a single space in an orderly world (Nigrelli, 2021). As Choay (1965) stated, the Industrial Revolution led to the creation of a new order that could be defined schematically through the rationalization of communication routes, the specialization of urban sectors, and the appearance of new urban functions (department stores, hotels, cafes, rental houses). The relative process of suburbanization gained increasing importance: the industry was implanted in the city’s surroundings, the middle and working classes were displaced to the suburbs, and the town ceased to be a well-defined spatial entity. All these transformations contributed, in the ancient cities of Europe, to blowing up the old layers, often juxtaposed, of the medieval city and the baroque city. This approach implied that the maintenance of the previous urban environment was unnecessary, highlighting the essentially destructive character of 19th-century urbanism (Sánchez de Juan, 2000).

The new dynamics from the industrial revolution generated difficult living conditions due to housing and labour phenomena. The exhausting rhythm of work in disastrous conditions caused an excessive expenditure of energy, exacerbated by the scarcity of food due to the demographic explosion. In addition, industrial pollution quickly worsened air quality. These elements favored the epidemic spread of tuberculosis, particularly in younger age groups from the poorer social classes (Sabbatani, 2005), fostered by a combination of poor diet, lack of sun, and overcrowding (Mumford, 2012). The impact on architecture was considerable and began with the active collaborations between architects and doctors in designing sanatoriums for tuberculosis. In the first half of the 20th century, improved socioeconomic conditions, public health measures, and the development of new therapies led to lower lethality of the disease. One turning point was the discovery of antibiotics, particularly streptomycin in 1943³, representing the first treatment for tuberculosis.

² The “depressionist” version speaks of a great recession marked by a severe agricultural crisis that affected the food market and its prices, causing widespread unrest and social tensions. At the same time, the economic and industrial sectors were weakened by the collapse of manufacturing activities. The “optimistic” version, on the other hand, leans towards a restructuring of the late medieval economy through a more or less rapid process of recovery and development in different sectors, closely related to the drastic reduction of demographic pressure on agricultural resources.

³ It was discovered by microbiologists Selman A. Waksman (1888–1973) and Albert Treasure (1920–2005).

The sanatoriums, faced with a decrease in hospitalization, were forced to convert to more specialized hospitals, an operation that implied a considerable investment that most could not afford. Consequently, many were gradually abandoned until the final closure, while others were transformed into psychiatric or geriatric centers, prisons or hotels (Duarte, 2015).

The impact of medical thinking on architecture led to a radical change in the way of understanding living spaces. The result was the design of buildings with white walls, flat roofs, large windows, terraces for sunbathing or exercise, hygienic bathrooms with tiles and streamlined furniture where dust could not accumulate. The characteristic elements of sanatoriums became the distinctive elements of the dwellings of the Modern Movement.

Conclusions

Diseases are a constant concern for architecture and urbanism, which have always taken care of the well-being of its inhabitants. Thanks to the study of major pandemics over the centuries and their consequences in architecture and urbanism, it has been possible to discover their strong interaction. Cities had a role of undoubted importance since they allowed limiting the spread of diseases by containing those factors that favoured the transmission. At the same time, however, they contributed to the spread of epidemics due to their configuration or precarious sanitary conditions.

Specifically, it is possible to identify the first attempts to manage and contain the contagion during the Plague period, with the appearance of lazarettos and measures based on isolation, prevention, disinfection and information. At the same time, the configuration of medieval cities and the relative hygienic-sanitary requirements led to the design, often only theoretical, of an “ideal city” based on principles of rationality and functionality. The subsequent urban realizations, first in Italy and then in Europe, reflected the need for a city characterized by an orderly form based on symmetrical geometric principles, although rather far from the theoretical utopian schemes.

Cholera caused substantial changes in urban and city planning. The current road networks of different cities result from a series of operations consisting in renovation, demolition or expansion, to solve sanitation problems. The scope of such interventions and the birth of the first laws to regulate their realization contributed to the development of modern urbanism.

Tuberculosis, however, initially directed attention to the structures designed to accommodate the sick, i.e. the sanatoriums. Different elements were considered, such as the orientation of buildings, the context in which they were inserted, the space distribution, the materials and interior furnishings. These aspects influenced housing design, from the outer envelope of the building to the furniture, to take care of their inhabitants both physically and psychologically.

But what will be the impact of Covid-19 on architecture and urbanism? And what can we learn from the past to prepare cities to contain a possible new pandemic? The results obtained during this study are the starting point for reflecting on the consequences it will have both in urban and residential planning. Architecture cannot provide immediate answers. Buildings, houses and cities cannot be transformed overnight to meet emerging health requirements or to adapt the spaces to new needs. The challenges posed by the pandemic involve a more balanced and flexible urban design, based on a new relationship between space and time, between private and public. However, this should also include a new relationship with privacy, community, equality, mobility, technology, energy, work and climate.

References

- Benevolo, L. (1972). *Historia de la arquitectura del Renacimiento* (Vol. 1). Taurus Ediciones.
- Bonastra, Q. (2000). Innovación y evolución de las concepciones sobre el contagio y las cuarentenas en la España del siglo XIX: reflexiones acerca de un problema sanitario, económico y social. *Scripta Nova: Revista Electrónica de Geografía y Ciencias Sociales*, 4(69).
- Bonastra, Q. (2010). Recintos sanitarios y espacios de control: un estudio morfológico de la arquitectura cuarentenaria. *Dynamis*, 30, 17–40. <https://doi.org/10.4321/S0211-95362010000100001>
- Bonastra, Q. (2012). Las formas de la reforma asistencial. El nacimiento de los lazarettos y de los hospitales renacentistas. In A. Pagès (Ed.), *Giginta* (pp. 197–217). Presses Universitaires de Perpignan. <https://doi.org/10.4000/books.pupvd.3606>
- Cantor, N. F. (2001). *In the wake of the plague: The Black Death & the world it made*. The Free Press. <https://www.pdfdrive.com/in-the-wake-of-the-plague-the-black-death-the-world-it-made-d199644159.html>
- Choay, F. (1965). *El urbanismo (Utopías y realidades)*. Lumen Editorial. https://kupdf.net/download/-francoise-choay-el-urbanismo-utopias-y-realidades-afpdf_5aa6cd10e2b6f5b15ec9bad2_pdf
- Colomina, B. (2021). *Arquitectura de rayos X*. Puente Editores.
- Del Cueto, B. (2021). Regreso al futuro: el patrimonio edificado en tiempos de cambio climático y pandemia. *Archivos de Arquitectura Antillana*, 78, 66–77. https://www.academia.edu/50158010/Regreso_al_futuro_el_patrimonio_edificado_en_tiempos_de_cambio_climático_y_pandemia
- Duarte, I. (2015). Sanatorios para tuberculosos: auge y decadencia. *Revista Médica Clínica Las Condes*, 26(3), 409–418. <https://doi.org/10.1016/j.rmclc.2015.06.018>
- Engels, F. (1845). *La situación de la clase obrera en Inglaterra*. Ediciones Akal.
- García-Ayllón Veintimilla, S. (2014). *Urbanismo y ordenación del territorio: manual de teoría*. Universidad Politécnica de Cartagena, Servicio de Documentación.
- González Toapanta, H. G. (2021). Pandemias en la historia: la peste negra y la gripe española, Covid-19 y crisis capitalista. *Chakiñan, Revista de Ciencias Sociales y Humanidades*, 14, 130–145. <https://doi.org/10.37135/chk.002.14.09>
- Google Earth. (2022). <https://earth.google.com/>
- Google Earth. (2023). <https://earth.google.com/>
- Isaacson, W. (2018). *Leonardo da Vinci: la biografía*. DEBATE.

- Malagnini, F. (2021). L'Argomento ~ Le parole dei Lazzaretti nel mondo. *Magazine de la Biblioteca Delle Isole*. <https://lazzarettiveneziani.it/largomento-le-parole-dei-lazzaretti-nel-mondo>
- Manzo, E. (2018). Architettura, città territorio: ricerche e riflessioni critiche. *Atti e Rassegna Tecnica Della Società Degli Ingegneri e Degli Architetti in Torino*, 1, 113–122.
- Mumford, L. (2012). *La ciudad en la historia: sus orígenes, transformaciones y perspectivas*. Pepitas de Calabaza.
- Nigrelli, F. C. (2021). *Come cambieranno le città e i territori dopo il Covid-19*. Quodlibet. <https://doi.org/10.2307/j.ctv2gz3z6s>
- Petracca, L. (2022). La crisi del Trecento e la Peste Nera. Letture e prospettive. *Bibliomanie. Letterature, Storiografie, Semiotiche*, 53(2), 19. <https://doi.org/10.48276/issn.2280-8833.9868>
- Quijano Ramos, D. (2011). Causas y consecuencias de los Grands Travaux de Haussmann en París. *Clío*, 37, 1–17.
- Sabbatani, S. (2005). La tubercolosi tra ottocento e novecento. Aspetti epidemiologici e ruolo del risanamento urbano nella prevenzione della tubercolosi a Bologna. *Le Infezioni in Medicina*, 1, 48–56. https://www.infezmed.it/media/journal/Vol_13_1_2005_9.pdf
- Sánchez de Juan, J.-A. (2000). La “destrucción creadora.” *Scripta Nova: Revista Electrónica de Geografía y Ciencias Sociales*, 4, 63. <http://www.ub.edu/geocrit/sn-63.htm>
- Sennett, R. (2019). *Construir y habitar: ética para la ciudad*. Editorial Anagrama.
- Urquía, M. L. (2019). *Teorías dominantes y alternativas en epidemiología*. EDUNLa. <https://doi.org/10.18294/9789874937209>
- Volcy, C. (2007). Historia de los conceptos de causa y enfermedad: paralelismo entre la Medicina y la Fitopatología. *Iatreia*, 20(4), 407–421. <https://doi.org/10.17533/udea.iatreia.4424>