

# TeMA

This Special Issue of TeMA - Journal of Land Use, Mobility and Environment, collects twenty-seven contributes of international researchers and technicians in form of scenarios, insights, reasoning and research on the relations between the City and the impacts of Covid-19 pandemic, questioning about the development of a new vision and a general rethinking of the structure and urban organization.

Journal of  
Land Use, Mobility and Environment

TeMA Journal offers papers with a unified approach to planning, mobility and environmental sustainability. With ANVUR resolution of April 2020, TeMA journal and the articles published from 2016 are included in the A category of scientific journals. From 2015, the articles published on TeMA are included in the Core Collection of Web of Science. It is included in Sparc Europe Seal of Open Access Journals, and the Directory of Open Access Journals.

*Special Issue*

**Covid-19 vs City -20**

scenarios, insights, reasoning and research

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University of Naples Federico II



# TeMA

Journal of  
Land Use, Mobility and Environment

## *Special Issue*

### COVID-19 vs CITY-20

### SCENARIOS, INSIGHTS, REASONING AND RESEARCH

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The cover image is a photo collage of some cities during the Covid-19 pandemic quarantine (March 2020)

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## *Special Issue*

### COVID-19 vs CITY-20

#### SCENARIOS, INSIGHTS, REASONING AND RESEARCH

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## Risk, health system and urban project

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### Abstract

The article aims to establish the relationship between risk and the Veneto health system. The analysis of this report focused on vulnerability and resilience, highlights the critical aspects on which to focus the reorganization and strengthening measures (health presidium) to face new pandemics and / or health crises. The strengthening of the health system, which has strong relations with the city, is also analyzed from the point of view of the urban project. Comparing various localization alternatives.

### Keywords

Risk analysis; Vulnerability; Resilience: Health presidium; Urban project

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## 1. Introduction

The Covid-19 pandemic is not over and will probably return in autumn winter. Also, in the coming years we can expect virulent attacks probably in different forms from Covid-19 as history of the last 60 years has taught us.

This pandemic has shown that health care in the Italian regions is structured and managed in different ways.. Even the most "virtuous" regions have suffered from the overload imposed by the emergency. Therefore, interventions to strengthen the health system will have to be envisaged, although in a different way from Region to Region.

The question which this article attempts to answer is: how to strengthen the health service both with new structures and organizational systems and how to distribute them on the territory. The feedback will be based on two levels: that of risk analysis and that of territorial health connection.

The (health) risk analysis is a function that depends on the probability and intensity of a certain event, but above all on the vulnerability and the level of organization of the stressed system(resilience). Vulnerability is characterized by the provision of healthcare facilities and resilience is the ability to respond and rehabilitate the stressed system.

Particular attention will be paid to new hospitals which, in my opinion, should be dedicated to the treatment of infections, including viral infections, of any kind. In order to understand how much the various diseases involve the health structure, the causes of death in Veneto (which is the region studied in this article)<sup>1</sup> have been observed, which for tumors are equal to 30%, for the circulatory system are equal to 35.1%, for infectious diseases are only 2.7%. The latter have been the subject of an eradication strategy that has reduced the health facility's commitment for infections<sup>2</sup>. It has been observed that the number of infections caused by Covid-19 created a crisis in the availability of hospital accommodation for a limited period of time (a few months) after which normality was restored. However, this crisis highlights the need to create flexible structures<sup>3</sup> for the future (in the following these will be called Health Presidium).

The choice of places where to locate the new Health Presidium<sup>4</sup> has consequences both on the efficiency of the service<sup>5</sup> and on the functionality of the city as a whole. In fact, hospitals are public places with great power of attraction for other complementary functions and determine strong relations with the city.

### 1.1 Risk

There are damages of natural origin (earthquakes, floods, fires, pandemics, volcanic eruptions) and of anthropogenic origin (industrial, infrastructural, transport accidents, etc.). These damages occur with a certain intensity that can be measured after the event: energy released, tidal level, flooded areas, area of pollutant release, collapse of viaducts, infected and dead population, etc.

It is difficult to predict the intensity, place and time when a certain harmful event will occur. The risk theory had formulated that the high intensity of the event at a long return period. Little harmful events are very frequent and very harmful events are rare. In the case of epidemics and pandemics, their repetition has been observed with increasing frequency. This is probably due to the intensive exploitation of natural resources (Diamond, 2019).

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<sup>1</sup> Relazione Socio Sanitaria, Regione Veneto, 2018.

<sup>2</sup> Ibidem

<sup>3</sup> That is, equipped with a certain number of fixed posts and another number of variable posts that can be used immediately in emergency response facilities.

<sup>4</sup> According to the first indications of the policy there will be a new hospital for every million inhabitants.

<sup>5</sup> It has emerged (Dr. Avruscio president Anpo) that the lowest mortality rate (17.5%) is associated with the availability of high level multi-specialties present in the University Hospital of Padua.



The first scientific study in Italy on risk theory is by Luciano Di Sopra (1986), who clearly expressed that risk is a function of: the intensity of a certain calamitous event (which he calls magnitude), the probability of this event, the vulnerability of the affected system (composed of people and physical environment) and the ability to respond, which is called resilience.

Any form of damage generates a social demand for assistance which must be answered by the institutions. As will be seen below, the social demand that arises doesn't have a simple relationship with the size or direct intensity of the damage because in the course of the emergency secondary forms of amplification of the damage may occur<sup>6</sup>.

The institutional response to mass emergencies is organized around two elements: prevention and emergency response<sup>7</sup>. The damage produces a destabilization of the system with respect to which autonomous rehabilitation - if prevention has been adequate - or assisted rehabilitation can be triggered. The latter is supported by external aid to the system which must support it in the crucial phase of the crisis, and which progressively enables it to proceed autonomously.

The magnitude of the damage<sup>8</sup> identifies the population size affected and the damage intensity profile - in this specific case - the "capacity" of the virus to infect.

Once the calamitous event has occurred - a pandemic due to a highly contagious virus - its immediate consequences depend on the vulnerability which, it has been observed, is mainly characterised by the equipment and places in intensive care facilities, the average age of the population with multiple pathologies<sup>9</sup>. At a later stage, the damage causes the loss of human life, and in order to avoid an unbearable overload on health care facilities, measures are introduced to restrict human contacts that cause the interruption of economic activities and social life. It is clear that with the same intensity of virulence, the different vulnerability of the territories has led to different damages.

*"Extreme events - underlines Di Sopra <sup>10</sup>- are not placed in an autonomous and isolated context with respect to the normal conditions of operation of urban and territorial organizations. On the contrary, extreme events make their general conditions of functioning more evident, in the same way in which the pathology contributes to better explain the physiology".*

The normal operating conditions of a social system are guaranteed by self-regulating operations called feedback processes. The system controls the flow through it by means of information, decision-making (to make the most appropriate choices) and action to implement decisions. These three factors are decisive in the emergency and are those that characterize the system's ability to respond (resilience) to external stress, they can accelerate the rehabilitation of the system or, on the contrary, they can increase its vulnerability and consequently the damage.

If structural defences and feedback capacity are limited only to responding to the most likely events (normality), high levels of vulnerability are achieved in the face of an unlikely situation. If, on the other hand, the system "retains the memory" of the greatest risks (the sequence and effects of pandemics over the last 60 years) and takes measures that make it less vulnerable, the risk of destabilisation will be lower.

It is evident that vulnerability depends both on a structural condition of the system and also on its ability to react to external stress.

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<sup>6</sup> Ibidem, p. 21. The risk analysis studies following Di Sopra's are numerous and it is impossible to mention them all. University courses are held on the subject, and case studies are carried out. But almost none of them, to my knowledge, has highlighted the feedback phenomena of the system and their effect on damage.

<sup>7</sup> Di Sopra p. 26 distinguishes between primary prevention and secondary prevention, but for immediacy we have adopted a terminology that can be understood erga omnes.

<sup>8</sup> Ibidem p 37.

<sup>9</sup> The vulnerability factors are these (perhaps the most significant) but there are still others.

<sup>10</sup> Ibidem p 96.

What Di Sopra defines as an institutional response to the emergence of the social demand caused by the damage, is a set of measures that are implemented in the axis of time.

The positive or negative effect of these measures is determined by a precise sequence of events and actions: the impact of contagion and social emergency; measures to protect the health system and lockdown; the gradual reopening of activities associated with safeguard measures; economic, social and cultural support; recovery/rehabilitation of the system in all its components. An error in the implementation time of the response-rehabilitation measures, amplifies the damage. A complex system requires capillary information, testing and forecasting capabilities, non-contradictory information. An inefficient management of feedback processes becomes a damage amplifier.

In summary, the risk is a function of an event probability, intensity, vulnerability and resilience

$$R = (f)(P, I, V, R)^{11} \quad (1)$$

## 2. Remembering Pandemics<sup>12</sup>

### *Asian disease*

First recorded in the Yunan Peninsula, China, the disease A (H2N2) virus of avian origin appeared in 1957 and in less than a year it spread around the world, killing one million people worldwide.

### *The Hong Kong disease*

The so-called Hong Kong disease is a variation of the disease A virus (H3N2) was recorded in this city in 1968 and spread worldwide with a pattern very similar to the Asian disease. One million people died from this new strain of disease.

Another major scourge of recent decades is undoubtedly the Ebola virus, an animal pathogen that causes severe hemorrhagic fever in humans. The disease was officially identified in 1976, and has caused several epidemics, with mortality varying according to the virus strain involved.

### *The Human Immunodeficiency Virus (HIV)*

One of the most serious and recent pandemics (1981) known to society today. It is estimated that HIV has caused around 25 million deaths worldwide.

In late 2002, SARS caused by a previously unknown coronavirus. It affected, in addition to China, other countries in the world, including several countries in Southeast Asia, Canada, also affecting several European countries, but in the end there were 8098 cases, 774 deaths, and a mortality rate of 9.6%.

In 2012, a new coronavirus, called MERS-CoV, appeared in the Arabian Peninsula. Cases were reported in Saudi Arabia, United Arab Emirates, Qatar, Oman, Kuwait and rare cases of imports to the United Kingdom, France, Germany, Greece and even Italy. The MERS coronavirus was much more dangerous: 2494 cases reported, 858 deaths, 34.4% mortality.

In 2019, a new coronavirus made yet another leap in species, perhaps less lethal, but much more contagious, and within a few weeks it had become a pandemic, a worldwide disaster. SARS-CoV-2 seems to be a little less lethal than the previous two, but unfortunately it appears instead highly contagious and, by the law of large numbers, the more people infected, the more it will kill, in the absence of treatments and vaccines to fight it. The main difference between pandemics and other harmful events of natural origin is that the latter affect a limited area. So far, we have been able to see that these events occur separately from one another, but the possibility of them occurring at the same time has not been taken into account. Yet in 2018 the Veneto region saw the storm Vaia, which knocked down 14 million trees, affecting 41,000 hectares and causing 2.8 billion €

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<sup>11</sup> The studies subsequent to Di Sopra's are many and it is impossible to mention them but in each of them the concepts of risk, probability intensity, vulnerability and resilience are included.

<sup>12</sup> <http://www.univrmagazine.it/2020/03/30/dalla-sars-al-covid-19-cosa-insegnano-le-epidemie-del-recente-passato/>

of damage. In 2019 there was an exceptional high-water level of 191 cm in Venice, which submerged about 80% of the ancient city, with still an imprecise estimate of the damage, which according to some people has reached 1 billion € and with the work MOSE not completed. In such conditions, monitoring and/or surveillance tools are needed to enable timely action at critical moments.

### 3. The intensity of virulence

91% of the excess mortality from Covid-19 found at the national average level is concentrated in the areas of high prevalence of the epidemic: 3.271 municipalities, 37 northern provinces plus Pesaro and Urbino. Deaths more than doubled in March 2020 compared to the average in March in the five-year period 2015-2019. Considering the period from February 20 to March 31, 2020, deaths rose from 26,218 to 49,351 (+ 23,133); just over half of this increase (52%) were positive deaths at Covid-19 (12,156). The average age of deceased patients positive for SARS-CoV-2 is 80 years. There are 10,936 women (39.1%). The median age of deceased SARS-CoV-2 positive patients is almost 20 years higher than that of infected patients (median age: deceased patients 81 years - infected patients 62 years).

More specifically, it can be noted that the contagion has affected Lombardy differently from Veneto. Out of a population of just over 10 million inhabitants (1/6 of the nation's total) 8.2% are the total infected and 0.15% the deceased, which corresponds to half of the national total: 15 thousand out of 30 thousand. In Veneto, out of a population of almost 5 million inhabitants, 0.45% were infected and 0.04% of the population died<sup>13</sup>.

This difference between two contiguous and economically highly developed regions has provoked many controversies and clashes at political level, but it is clear that analyzing the difference in terms of risk assessment, the different incidence of covid-19 in Veneto compared to Lombardy is due to two factors: vulnerability and resilience.

Vulnerability can be expressed as fragility, which is an intrinsic characteristic of the system both structural and functional. A health care system without adequate ICU places has a greater vulnerability than a system with a high number of ICU places.

In addition, the lack of research facilities, the reduced stocks of therapeutic devices such as reagents, masks, instrumentation for rapid swab analysis, are all factors that increase the vulnerability of the system.

A research carried out in 2011 as part of the Epiair programme for the setting up of a health surveillance system at ASL 16<sup>14</sup> in Padua, provided a credible indication of the health situation of the population of the city of Padua, which amounted to 411.731 inhabitants<sup>15</sup>. In 2011, infectious diseases accounted for about 7% of the total, while cancer accounted for 11.3% and circulatory system diseases accounted for almost 15% of the total<sup>16</sup>.

Data at regional level show a strategy aimed at the eradication of infectious diseases. In fact in Veneto the main infectious diseases show a constant decrease over time. In this structural situation, the pandemic has intervened, which has been discharged on the availability of beds and especially on those for intensive care.

#### 2.1 Vulnerability

The first parameter related to the vulnerability of the health system to face the pandemic is given by the beds in the intensive care unit, which have increased considerably in all regions during the pandemic. In the Veneto region, the number of ICU seats increased from 494 to 825 with an increase of 331, resulting in a ratio of 14.5

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<sup>13</sup> [https://www.epicentro.iss.it/coronavirus/pdf/Rapporto\\_Istat\\_ISS.pdf](https://www.epicentro.iss.it/coronavirus/pdf/Rapporto_Istat_ISS.pdf)

<sup>14</sup> Since 2010 the ALS 16 has become ASL 6 including all the municipalities of the province of Padua.

<sup>15</sup> [www.demo.istat.it](http://www.demo.istat.it)

<sup>16</sup> [www.epiair.it](http://www.epiair.it)

ICU seats per 100,000 inhabitants; In Lombardy, the number of IT seats increased from 861 to 1299 with an increase of 438, resulting in a ratio of 6.6 TI seats per 100,000 inhabitants.

Unfortunately, we do not have homogeneous data and there are marked differences between those reported by the Civil Protection and the official data of the Veneto Region, but if both were to be true, it would result that from 2016 to 2020 the places in intensive care (ICU) in Veneto have gradually decreased over time, to be immediately reconstituted during the lock down.

In addition to this, the control of the spread of the virus also took place with a precise "logistics" which took the form of the definition of paths of entry and exits of covid patients separated from the rest of the hospital, as the experience of the city of Wuhan had clearly demonstrated at the time.

## 2.2 Resilience

Resilience is the ability of the system to restore pre-impact conditions and also to decrease vulnerability to the repetition or continuation of the same event in the future. Vulnerability and resilience are closely related.

The control of communication flows and times is a fundamental element to correctly address social behaviour. But it is essential that the difference between information and communication (Cavazza, 1997) is clear, i.e. that it is necessary that the issuer of the message uses a code understandable to the recipient of the message itself. Who is speaking, what is being spoken about, who is being addressed, are the factors of communication; if the speaker uses a code that is incomprehensible to the receiver, only the effect of causing noise is obtained<sup>17</sup>.

In addition, when the crisis response measures are not announced<sup>18</sup> within the stated time frame, there are two effects: the first is aggravation of the damage<sup>19</sup> and the second is social mistrust<sup>20</sup>.

The higher the contaminating "power" of a certain virus and the resulting demand for ICU posts, the more external help will be needed both to deal with the emergency and to restore the pre-existing conditions.

The high contaminant "power" of the virus and the consequent demand for ICU posts, requires external help both to cope with the emergency and to restore the pre-existing conditions. Therefore, we need a rapid intervention system equipped and able to activate help and collaboration mechanisms in order to move resources from undamaged systems (preferably within the limits of their surplus) to damaged systems.

In the case of Covid-19, this shift has shown precise limits by forcing the interruption of traditional treatments, such as cancer and cardiovascular treatments (which are the ones that engage the health system most in terms of hospitalizations), which will not decrease over time, but presumably will tend to increase as the population ages. These will not be able to withstand for long the transfer of resources such as ICU beds to the infectious sector. It is therefore necessary to establish an additional number of beds for hospitalization and pandemic IT. In addition, these additional beds should be of two types: stable and flexible. That is, the structure should be such that it responds to an immediate additional demand for beds every 5-10 years and maintains a supply of fixed (structural) beds that meets standard demand. Among other things, it is necessary to consider the availability of emergency medical personnel who in the Veneto case were recruited from postgraduate courses in medicine, which were of great help. Resilience therefore reduces vulnerability and is

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<sup>17</sup> Ibidem.

<sup>18</sup> We mention only the basic concepts of communication without going into details of what happened in the pandemic, which deserves a separate discussion. But the information-communication dyscrasia has manifested itself not only in Italy.

<sup>19</sup> Decision and implementation are two of the three elements that support the feedback of a system (V Di Sopra) and are the channels through which resilience runs.

<sup>20</sup> One for all Mario Draghi in the Financial Times 25-3-2020. These, too, are aspects that go beyond the subject matter addressed in this article and require much more space, but their enormous weight in the current situation is evident.

based on two elements: rapid intervention and prevention, which must be supported by careful and constant monitoring.

The article by Binkin et al. (2020) confirms, albeit with the attention of the first analyses, that "Western healthcare systems have been built around the concept of patient-centred care, but an epidemic requires a change of perspective towards a concept of community-centred care".

The greater integration of health and hospital services in Veneto at local level and the presence of a strong public health infrastructure, have favoured the implementation of an initial community approach. This approach is based on solid epidemiological principles: sweep tests, contact tracing and limiting contact with healthcare facilities, where possible through mobile diagnostic teams and close monitoring at home.

This was facilitated by rapid communication via a computer system linking the laboratory, general practitioners and local public health units.

## 2.3 Monitoring

In Veneto the situation is monitored by a program, in use by the Region since February 24, immediately after the first death for Covid-19 at Vo' Euganeo, and active since March 8. It highlights the number of contagions updated from hour to hour. The system allows you to tighten the focus on the neighborhoods, with the streets and house numbers where there are infected. Tick the identity of each positive case and a list of related information: age, health card, doctor, cohabitants and, lastly, place and employer.

The people mapped by this geolocation system by May 5 were 18 thousand, but they are increasing every day. Knowing where the positives live makes it possible to identify their close contacts, find the micro outbreaks of contagion, and nip them in the bud.

The surveillance was accompanied by the policy of widespread swabs, even on asymptomatic patients. The reagents are produced on their own.

The data from three archives were cross-referenced: the health registry office to obtain the house numbers of infected persons and cohabitants, the health personnel database, and the Veneto Lavoro database, the regional agency that collects information from all employees of companies and employers<sup>21</sup>.

In summary, the elements characterizing vulnerability/resilience to the covid-19 pandemic can be highlighted with the following list:

- ordinary and emergency ICU beds;
- logistics of routes;
- multiskilled high level;
- backup medical personnel;
- community-centered assistance;
- integration of health and hospital services;
- rapid response;
- epidemiological monitoring, materials and equipment.

## 3. Definition of vulnerability and resilience criteria

*Ordinary and emergency intensive care (ICU) beds:* ordinary ICU beds are those in hospital facilities that will be further increased in the new Covid hospitals or rather for infectious diseases. Their number will be defined not only on the basis of the experience of recent months, but of more articulated forecast parameters. The emergency ICU posts, on the other hand, are those necessary for influenza peaks, which will have to be set

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<sup>21</sup> M. Gabanelli, Data Room Corriere della Sera del 9-5-2020.



up very quickly and then dismantled and stored in warehouses. The regulations in the process of approval (DL Revival of 16-5-2020) have introduced the possibility of reusing, through adaptation, even hotels that are not in operation;

*Logistics of the routes:* this criterion concerns two elements, the first of which relates to the entrances and exits from the hospital, which must not only be separated from each other but clearly distinct from all the others in the hospital in order to avoid any form of contagion. Secondly, it also refers to the local infrastructure network and its connection both with the hospital and with the major roads;

*High level multi-specialties:* this concerns the presence of high level skills normally, although not exclusively, present in University Hospital Organizations.

*Spare medical personnel:* these are personnel with sufficient basic medical skills to guarantee the care and assistance of patients in times of peak disease.

*Community-centred care:* this parameter concerns the public health network that showed these differences between the two regions Lombardia and Veneto: Public Health Laboratories: Lombardia 1/ 3 every ml/ab and Veneto 10/ 3 every ml/ab. Departments of Public Health Prevention: Lombardy 1/1.2 ml/ab and Veneto 9/ 1.2 ml/ab. Integrated Home Care: Lombardy 1/ 100,000 ab and Veneto 3.5/100,000 ab .

*Integration of healthcare and hospital services:* blanket testing, contact tracing and limiting contact with healthcare facilities, mobile diagnostic teams and home monitoring. Rapid communication through a computer system connecting the laboratory, general practitioners and local public health units.

*Rapid intervention:* availability of means, personnel and organization to make the integration of health services efficient.

*Epidemiological monitoring:* creation of a surveillance system for the number of infections, with location of the neighbourhoods, streets and house numbers where the infected are located. With identification of the identity of each positive case and provision of a list of related information: age, health care, treating doctor, cohabitants and, lastly, place and employer.

*Monitoring of materials and equipment:* it concerns the constant control of materials and equipment essential to cope with the onset of influenza peaks, with lists of certified suppliers.

*Availability of areas:* this factor is decisive in the health/territory relationship as the provision of areas, better if free, is a very important procedural aspect for the acceleration of time.

#### 4. The reference population

From 2011 to 2016 the health structure of the ULSS was modified by re-merging them in relation to the Provinces for which the ULSS 16 became ULSS 6 Euganean coinciding with the perimeter of the Province which has 936,000 inhabitants.

The metropolitan area includes 13 municipalities and has a population of around 430,000 inhabitants, therefore the remaining 507,000 are distributed between the Upper Padua area which is more populous and the rest of the province. All these districts have an "ordinary" hospital facility.

#### 5. The alternatives

First alternative: use of the city's equalization areas

This solution provides for the relocation of one or some of the structures in the semi-peripheral areas of the city. From the urban planning point of view, these are functions of a certain importance for their ability to redevelop the settlements in which they are located.

The Municipality of Padua has prepared over time a series of areas, called integrated and environmental equalization, as in the image map below.

The urban equalization set up in Padua as in many provincial capital cities in central and northern Italy, provides for the unification of the properties of which 70% of the surface is given free of charge to the City and the remaining 30% is built by the consortium of private individuals. These are areas of various sizes but can reach a total of 150,000 square meters of which more than 100,000 can be made available for one or more local hospitals.

*Second alternative distribution of the health presidium in the metropolitan area*

The second alternative is to locate the health presidium in an area coinciding with that of the Metropolitan City which includes Padua and all 13 municipalities of the first belt. The fundamental difference from the first alternative consists in a possible greater diffusion on the territory but it introduces the urbanistic problem of the availability of the areas because all the other municipalities of the Province, including those of the belt, are without forms of free transfer of the areas.



**Fig.1 Equalisation areas in the Municipality of Padova-in orange the integrated urban equalisation and in green the environmental urban equalisation**

*Third alternative supported by the social-healthcare facilities and distributed the health presidium in the Province*

Connecting the structures to the social and health districts by providing a section for infectious diseases functionally separated from the rest of the structure with specialist equipment also in intensive care and with a space for the installation of a field hospital for health emergencies.

The district is a structure that operates on a specific territorial area spread throughout the Province and the ASL which is equipped with technical-managerial autonomy and operates for primary care, in outpatient and home, through general practitioners (MMG), pediatricians of free choice (PLS), night and holiday medical services and specialized outpatient clinics; it coordinates the GPs and PLS with directly managed operating structures and with specialist outpatient services and hospital and extra-hospital facilities; and it provides social-health and nursing services.

## 6. The scenarios

The scenarios taken into consideration are two: a short-term one that assumes a resurgence of the infection in the months of autumn-winter to which can only be responded with a strengthening of the emergency response and resilience parameters associated with it such as field hospitals, reserve personnel, etc..

The second scenario, on the other hand, is a medium-term one (2-3 years) in which it is possible to carry out the necessary hospital works (health presidium) and all those interventions that reduce structural vulnerability. The criteria considered in the short term are the following and all related to response capacity (resilience): Emergency ICU posts, emergency medical personnel, emergency response, route logistics, epidemiological monitoring, material and equipment monitoring.

In the logic of the comparison method adopted - compensatory aggregative multi-criteria analysis - the criteria highlighted in Fig.2 acquire greater importance than the others, as shown in the column of eigenvalues expressed as percentages.

	Criteria	Importance
Vulnerability	Structural intensive care unit	3,7%
	Research and training	3,7%
	Multi-specialty	2,7%
	Community assistance	1,7%
	Integration of health and hospital service	1,7%
	Availability of areas	1,7%
Resiliency	Emergency intensive care unit	15,9%
	Emergency medical staff	15,9%
	First aid	15,9%
	Route logistics	7,0%
	Epidemiological monitoring	13,9%
	Monitoring of materials and equipment	16,3%
	TOTAL	100,0%

Fig.2 Short term scenario

In the medium-term scenario, it is assumed that structural interventions are carried out, i.e. those that lower the structural and functional vulnerability that will result in the logic of multi-criteria as an increase in the importance of the relative criteria. Fig.3 highlights this change in relative importance.

	Criteria	importance	Urban area	Metropolitan area	Country
			performance	performance	performance
Vulnerability	Structural intensive care units	13,9%	0,0580	0,0402	0,0402
	Research and training	13,9%	0,0731	0,0461	0,0193
	Multi-specialty	9,3%	0,0562	0,0236	0,0149
	Community assistance	6,4%	0,0172	0,0178	0,0206
	Integration of health and hospital service	6,7%	0,0193	0,0193	0,0193
	Availability of areas	7,1%	0,0431	0,0181	0,0114
Resiliency	Intensive emergency care units	6,6%	0,0191	0,0191	0,0191
	Emergency medical staff	6,6%	0,0346	0,0191	0,0105
	First aid	7,1%	0,0376	0,0237	0,0100
	Route logistics	5,8%	0,0170	0,0170	0,0170
	Epidemiological monitoring	8,4%	0,0243	0,0243	0,0243
	Monitoring of materials and equipment	8,4%	0,0243	0,0243	0,0243
	TOTAL	100,0%	0,4239	0,2927	0,2310

Fig.3 Medium term scenario 1

In the comparison between the alternatives, it is preferable to locate the hospital in the urban area and the determining factors (highlighted in red in Fig.3) are:

- The posts in structural ICU;
- The plurispeciality: which is a fact linked to the proximity to the high specialization centres within the university hospital function of the city;
- Research and training.
- The availability of areas: this factor is decisive because, as explained above, the city has free areas at no cost and without the need for changes in the urban plan.
- The emergency medical staff: which in the case of the city is mainly made up of trainees present only in medical university facilities.

Emergency intervention: which is linked to logistics and favourable road routes.

Other criteria factors are location-independent such as the number of emergency IT stations, logistics and monitoring. Finally, the criterion of Community Assistance, which depends on the proximity to the territory, shows greater effectiveness the more widespread it is throughout the province.

The multi-criteria analysis lends itself to verify even if the variation in importance of the criteria also varies the performance of the alternatives.

	Criteria	importance	Urban area	Metropolitan area	Country
			performance	performance	performance
Vulnerability	Structural intensive care units	9,4%	0,0395	0,0274	0,0274
	Research and training	10,8%	0,0571	0,0360	0,0151
	Multi-speciality	7,3%	0,0439	0,0184	0,0116
	Community assistance	20,2%	0,0587	0,0587	0,1363
	Integration of health and hospital services	20,7%	0,0601	0,0601	0,0601
	Availability of areas	4,6%	0,0135	0,0135	0,0135
Resiliency	Intensive emergency care units	4,2%	0,0121	0,0121	0,0121
	Emergency medical staff	4,2%	0,0220	0,0121	0,0067
	First aid	4,7%	0,0250	0,0158	0,0066
	Route logistics	3,8%	0,0110	0,0110	0,0110
	Epidemiological monitoring	5,4%	0,0158	0,0158	0,0158
	Monitoring of materials and equipment	4,6%	0,0135	0,0135	0,0135
TOTAL		100,0%	0,3722	0,2944	0,3297

Fig.4 Medium term scenario 2

Fig.4 shows an attribution of importance that gives priority to community care and the integration of hospital services with percentages above 20% compared to 6% in Fig.3. On the basis of this assessment, the total performance of the Country alternative rises almost to that of the Urban alternative. However, the overall distribution of total performance values between the Fig.3 and Fig.4 alternatives does not change. But the greater importance attributed to "Community assistance" and "Integration of health and hospital services" could reflect an evaluation of health strategy - which cannot be defined in this article - which, by favouring these criteria, suggests that it is necessary to attribute more financial resources to this component than to others. In this case, the value of performance becomes a parameter of comparison between the different allocations present in the regions and the related strengthening commitments to cope with future epidemics/pandemics. The criteria of vulnerability and resilience, adopted, which refer to the strengthening of the hospital structure (health presidium) privilege the urban alternative. The criteria that refer to the

strengthening of community care and the integration of services privilege a widespread distribution throughout the provincial territory. The other criteria concerning logistic and monitoring functions are equivalent among the alternatives considered, but this does not mean in absolute terms that the strengthening can be renounced. On the contrary, the monitoring functions are fundamental because they make it possible to keep the functioning of the health system under constant observation, they make it possible to outline trends and verify the achievement of set objectives and consequently to act promptly to make corrections.

## 7. The relationship health territory

The new infection control structures (health presidium) should carry out a series of health care activities such as to make these structures a real hospital and to avoid the "lazaret" effect and, in addition, spaces should be provided for them to set up field hospitals to be used for emergencies and to cope with overloads.

The organisation of the facilities is both a preventive and an emergency response. Preventive because it puts in place a territorial structure closer to the citizen and his "daily" health needs and lightens the central structure of all these functions, allows monitoring on site, but also from the point of view of the emergency can provide support to sudden peaks of infections.

The issue of location immediately opens up the issue of the availability of areas and the consequent relationship with the government of the territory. One of the major obstacles for the rapidity of the realization of works of the sanitary type, but not only these, is the excessive bureaucratization of the Public Administration. This opens a bifurcation in the decision-making process: following the path of the derogation from the Urban Plans (urged by many political and entrepreneurial forces) or preparing variants centred on the principle of the urban project. The danger of the first solution is that the possibility of combining new interventions with urban quality will forever escape. For this reason, we have added among the parameters of vulnerability that of "Availability of areas".

Hospitals have so far been designed and built as self-referential structures and never alongside spaces (squares) of "mediation" of interpersonal and social relations which are the natural extension of the primary public function towards the urban context. The square is the place of organization of irradiation of the hospital's relations with the city (Archibugi, 2003). The hospital (which must, however, maintain a series of accesses separated from the square) until today has been formally conceived as a structure that "turns its back" on the city even though it has very intense relations with it.

Given their attractiveness, these structures must be inserted within precise relational spaces, with differentiated entrance and exit routes, places of social relations (squares) and the location of complementary functions: trade in health products, catering and hospitality, connected medical and health practices, parking and areas for the transit of public and private non-confrontational transport, reserved pedestrian and cycle paths, etc..

The most recent projects and related achievements of hospitals are designed as places self-referential as if they could be placed in any place or territory not keeping and not even the speculative processes that trigger them. The engines of major urban transformations such as hospitals, bring into play considerable interests and considerable forms of pressure, because they trigger upward real estate values. This appreciation for private individuals, which derives from the investment of public money, must have as counterpart a benefit for the community, first of all, in terms of urban quality.

For this reason, the project for a new hospital must also and above all be an urban project. This term means not only a foreshadowing of the form and construction methods, but above all of the ways in which the new project relates to the existing city, the environmental impacts it produces and must take into account the public consultation. To be as clear as possible let's say that the effect of a new hospital can be compared to the introduction of the turbo on an aspirated engine: in order for the car so enhanced not to go on its own, it



is necessary to adapt brakes, suspensions, chassis, exhausts, tires, introduce an electronic control. The relationship of the engine to everything else is under discussion. Out of metaphor only in this way you get the urban quality and triggers the city effect (Archibugi, 2003) that is a multiple outcome as multiple is the city (Camagni, 2002). The city has become more and more a product-goods to sell on the market within the supply-demand ratio that does not arouse heimat<sup>22</sup> and search for new needs but disorientation (Duso, 2003). On the contrary, the city is a set of agglomeration and spatial interaction in a multiple, composite, articulated physical space that at the same time is the place of life and work of citizens, the place of proximity, the general condition from which each one of them is recognized, and to this end its parts must be organized.

## 8. Conclusions

The pandemic response legislation is constantly evolving, and it is not excluded that new measures will be introduced in the future which could partially change the framework of this article. The fact remains that a number of elements have now been defined (the assessment criteria for vulnerability and resilience) and we believe that there will be no major changes.

During the writing of this article, Phase 2, i.e. the progressive resumption of activities suspended with lockdown, began in Italy. Fears of a resumption of contagion are still high and there are still many uncertainties on the scientific-medical, economic and social level in general. Then it is not yet known how Phase 3 will be set, which should lead to "normalization". But it is already known that a large part of the economic activities of labor-intensive services will be significantly downsized and will face increasing costs. Not all industrial activities will resume and there is likely to be a fall in income and domestic demand. Phase 3 will have to address the issue of a new fiscal policy and the de-bureaucratization of procedures.

In such a delicate moment the daily emergency does not allow us to look far and for this reason we have tried to tackle the relationship between health and territory with a certain scientific rigor in order to offer the political decision-maker the instruments that are based on solid foundations.

It is clear that the place of life of the population, the city, will be the physical space in which the pandemic-induced change will be experienced. Of this space, the health system is an important part of it, both as concentrated and distributed physical structures; as competences; as monitoring and communication systems; as emergency assistance and service integration devices and for all the induced activities it generates.

The application of multi-criteria analysis should not be understood, in this case, as a method to exclude or prefer one alternative over the other, but rather to understand, in the face of the selected criteria of vulnerability and resilience, how to restructure this system in the various regions of the country where the major critical issues have been highlighted and how this restructuring or strengthening will affect the territory.

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<sup>22</sup> Eigler talks about heimat as an intersection between memory and space, De Gruyter (2012).

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