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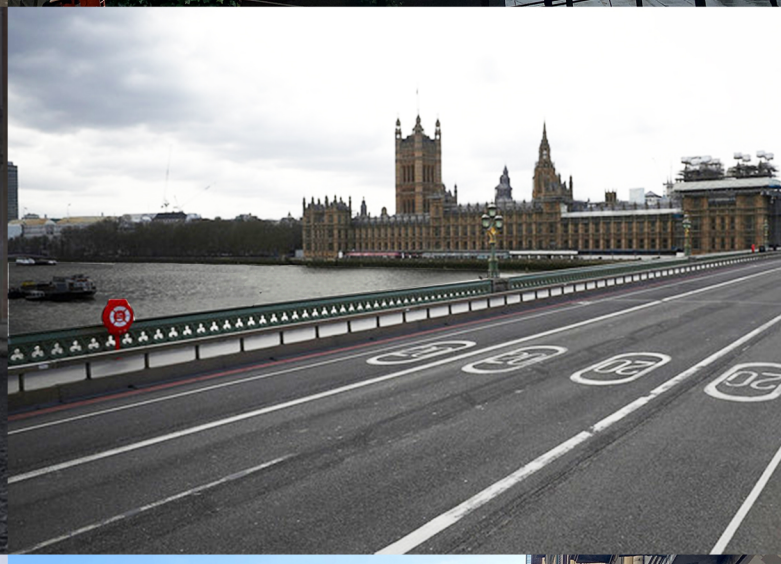
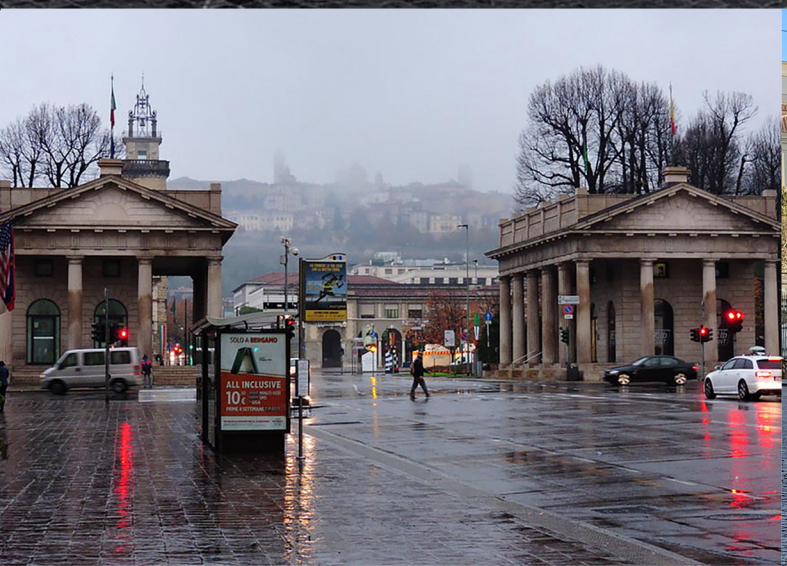
Special Issue

Covid -19 vs City -20

scenarios, insights, reasoning and research





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SCENARIOS, INSIGHTS, REASONING AND RESEARCH

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Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"
Piazzale Tecchio, 80
80125 Naples
web: www.tema.unina.it
e-mail: redazione.tema@unina.it

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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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Geographic Information and Covid-19 outbreak Does the spatial dimension matter?

Michele Campagna

DICAAR - Department of Civil and Environmental Engineering and Architecture
University of Cagliari, Italy
e-mail: campagna@unica.it
ORCID: https://orcid.org/0000-0002-2526-2432

Abstract

The Covid-19 pandemic in Europe started its outbreak in Italy in January 2020, and since early March 2020, it rapidly spread in most European Countries with growing diffusion rates. EU Countries applied lock-down measures accordingly. While Government across Europe relied in experts' advice, scientific advisory teams were often lead by virologists and epidemiologists, and no evidence is easily found about the involvement of experts in spatial planning and design in emergency response. Often in the uncertainty of a new hazard emergency response, lock-down measures were based on national or regional scale planning, applying to large administrative units boundaries with little or no local differentiations.

This paper argues that a large-scale approach may be more effective in emergency response planning and management as it may better take into account local variations. This approach might be an important and still missing step for balancing the conflict between the two most urgent goals in the current emergency response: public health and safety vs economy re-start after the emergency lock-down.

Keywords

Coronavirus; Covid-19; Geographic information; GIS, Planning support systems (PSS); Geodesign.

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Preface

At the time of starting to write this paper the author is completing the phase 1 period of national lock-down to address Covid19 epidemic in Italy, and approaching the phase 2, in which the progressive release of lock-down measures is foreseen if the number of positive cases will continue to diminish as in the previous weeks after the peak of infection spread was reached and passed. In this situation the content of the paper is grounded on a constantly evolving situation and fluctuating availability (or lack, in some respects) of data and information.

Nevertheless, the paper aims at formalizing, as far as possible in a systematic way, the author's evolving observations and reflections along the lock-down phase 1 (i.e. strict home confinement rules) and 2 (i.e. gradual releasing of lock-down rules and guidelines) focusing on Italy, on the background of the European context, with the support of the analysis of scattered information gathered through the news media and data available in official and volunteered data sources.

The perspective offered in this contribution is that one of an academic with a background in spatial planning and design, and planning support systems. The aim is to offer a preliminary discussion which may provide some useful hints for addressing the current Covid19 pandemic and in planning effectively the return to pre-epidemic "normality".

As is it discussed and documented in the paper, up to the extent which is currently possible, the underlying assumption is that to date little or no attention was given in Italy by institutions to the large-scale spatial dimension of pandemic, neither in understanding the phenomenon nor in the design of containment and response measures.

This contribution is inspired by and dedicated to all those individuals around the world, who without any reserve offered their own skills and hard work, often scarifying and putting at risk their own and their families' safety to help their communities.

A disclaimer statement is appropriate. It is not intention of the author to provide sound scientific knowledge for recommendation to decision-makers: this would be far too ambitious in dealing with an unprecedented phenomenon of this magnitude and its implications in the very short term. Rather, this paper is intended to offer hypotheses for a workable approach in addressing emergency and post-emergency phases from a scholar perspective of an observer with a theoretical and applied background experiences in spatial planning, design and decision-making. As such, it may be considered as a sort of discussion paper, which may possibly help in identifying urgent issues to be addressed by the research agenda in spatial planning and design in the short and medium term, supporting a possible role spatial planners and designer may contribute.

1. Data availability at the time of Covid19: focus on Italy

Covid-19 pandemic was unprecedented in current times. Covid-19 viral behaviour is novel and uncertain. As such, preparedness was understandably very low in many Countries, notwithstanding some Countries were (or were supposed to be) prepared at least in principles to such kind of epidemic hazards, which happened already in the recent past, still with a lesser degree of magnitude and impacts.

In Italy, as well as in many European Countries however, emergency response often appeared frantic, controversial, and paramount decisions where taken on a day-by-day basis and iteratively, as the outbreak diffusion was unusually fast, and data and information were limited, fragmented, and often inconsistent in different regions and countries. The latter situation generated not few factors of uncertainty in understanding the phenomenon and in planning the urgent emergency response, which is understandable, but also an urgent issue to be addressed.

1.1 Official data sources

At the global level, notably, the Centre for Systems Science and Engineering (CSSE) at Johns Hopkins University, already since February 2020, when the awareness of Covid-19 spreading outbreak in the news appeared limited to China and Italy only, made available a web/mobile app monitoring real-time the epidemic worldwide relying on novel ESRI geographic dashboard technology (Dong et al, 2020). Providing real-time data at various resolutions, the geographic dashboard was a useful tool to monitor and understand the situation at the global scale.

In Italy, two major sources of official information were given public access, namely a daily tabular report on new cases at the Province level by the Department of Civil Protection of the Presidency of the Council of Ministers (PCM-DCP) and a weekly analysis detailed in a report by the Italian National Institute of Health (ISS). The PCM-DPC provides tabular data through the github.com platform (https://github.com/pcm-dpc/COVID-19/), while the ISS publishes a text report in pdf format in its website (https://www.epicentro.iss.it/corona-virus/) with the national and regional progress updates. The latter provided by region maps of the diffusion at the municipal level (hence, data were available!), however they were reported only in static choropleth maps in pdf format, hence of limited use for further analysis, unless long and tedious digitizing procedures would have been applied by the prospective volunteer investigator, still with a high risk of loss in accuracy.

Indeed, this lack of large scale data easily available in the public domain might have potentially hindered the mass of skilled researchers and specialists to join the critical mass of investigators and designers aiming at providing reliable solutions to the pandemic understanding and responding issue. In fact, many analysis and forecasting models were published in the web by volunteer analysts worldwide, but to a much lesser extent, they involved the use of maps and spatial analysis and statistics.

To put this issue in context, it should be noted that since the United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters was adopted on 25 June 1998 in the Danish city of Aarhus (Århus) it was accepted the assumption that environmental information should available to the wider public. Accordingly, and in line with broader policies aiming at implementing the principles of Sustainable Development (Campagna, 2005), the INSPIRE Directive, establishing an infrastructure for spatial information in Europe to support Community environmental policies which may have an impact on the environment entered into force in May 2007 (Directive 2007/02/EC). INSPIRE requires public authorities in the Member States to provide seamless access to spatial data themes as detailed in its Annex I, II, and III. Notably, Annex III lists a series of spatial data themes including "Human health and safety" which concerns among other issues the "*Geographical distribution of dominance of pathologies (allergies, cancers, respiratory diseases, etc.), information indicating the effect on health (biomarkers, decline of fertility, epidemics)*". Applying the INSPIRE principles in this respect, would have been of potentially paramount benefits for not only spatial data and planning specialists could have contributed to earn deeper insights on the pandemic dynamics, but also for concerned citizens could have earned a deeper sense of the diffusion rates in their localities and apply confinement protocols and guidelines (to be possibly designed to address specific local conditions) accordingly.

I will support at first the assumption of the importance of a local approach based on large scale data with an example taken from reality (specific reference to individuals are omitted, but the fact was reported by the news, such as in The Guardian as by 22 May 2020). The case features a presidential mandate which declared churches, mosques and synagogues "essential services" and threatened to override governors who refuse to reopen them. As answer to the presidential call, one of the concerned governors (as reported by ABC 10 News also in 22 May 2020), responded adopting an approach based on the differentiation, the large mega-churches versus more neighbourhood-style churches and different styles of pews and sanitation protocols, synagogues

versus working with other faiths. Developing sectoral guidelines, possibly based on local territorial conditions, seems definitely as a sensible approach. Indeed such an approach would require major resources dedicated to data collection, analysis, planning and design, and implementation, but would also overcome, where reasonable, limitations to individuals in exerting their right of freedom of worship. In other words, simple, strict, general common national lockdown rules and guidelines may be the proper sensible cautious approach as far as information is missing and pandemic dynamics are unclear. However, as soon as, data and information would be available they should be made value of, and lockdown measures should perhaps be carefully differentiated by regional and urban contexts, in order to reduce the many negative impacts on economy and quality of life of the local socio-economic systems produced by strict lockdown measures. If this is true, seamless access to large-scale data and information would enable local decision-makers to devise contextual rules and protocols to balance the fulfilment of both human health and economic and social well-being locally. In addition, it would possibly enable individuals in local communities to adopt a responsible approach based on better local information. Indeed, while many Countries in Europe in a state of extreme emergency adopted strict mandatory lock-down rules (and this was possibly the only responsible approach in many cases), others, such as Sweden, rather than issuing compulsory measures, opted for informing the public and providing recommendations and indicative guidelines to citizens. While it is too early to measure the success or failure of such alternative approaches, which may also substantially depend by local social attitude and behaviours to apply guidelines vs normative rules, the two different approaches are worth to be considered as alternative possibilities, as the underlying respective positive and negative may be expectedly substantially different, not to mention the implications on the varying degree of limitation on the freedom of individuals.

1.2 May volunteer geography be of help?

Following widespread diffusion of Internet in the last two decades, geospatial web technologies started their advances and diffusions as well, and together with pervasive diffusion of locational sensors with individual hand-held devices (i.e. smartphones) and location-based services (i.e. apps) the first decades of the new century saw the rise of citizens observation and volunteered geography (or geographic information, VGI), neo-geography, and citizens (geographic) science (Goodchild, 2007; Haklay, 2010; Wilson & Graham, 2013). All together these phenomena concern the production and sharing of (geographic) information generated by geo-browsers or collected by hand-held GPS-enabled devices or other locational sensors by interested citizens, in many case to contribute to solve a common issue of concern (i.e. active VGI), or just as a side product derived by the everyday use of social media (i.e. passive VGI, or Social Media Geographic Information, SMGI. Campagna, 2016). In such domain, many initiative flourished and many were proven successful in helping to map uncharted territories (e.g. openstreetmap.org), to develop community initiatives (e.g. Ushaidi.com), to support emergency mapping and response (Scholtz et al. 2018), or citizens science research (e.g. projectnoah.org), to name only few examples developed in the possible many application domains.

With particular reference to the Covid-19, the use of smart-phones' location sensors was proposed in many Countries to monitor individuals contacts (using the Bluetooth technology) for contacts tracing, and to use this information to monitor the network of individuals social contacts in case contagion (Boulos & Geraghty, 2020). While the privacy in the use of this kind of app and its acceptability by citizens may be controversial (Abeler et al., 2020), it is reasonable to assume that technology issues concerning privacy protection can be solved, and in the case of unprecedented emergency as the current one, many concerned citizens would be willing to share georeferenced information about their state of health, especially if the resulting big data would help ensuring more timely, location dependent, near real-time emergency response, including the definition of local containment measures planning and design which would ensure safety, while minimizing side socio-economic effects and negative impacts. In fact, such an approach was proven successful in addressing other urgent

environmental concerns such as air quality (EEA, 2019), and it might be likely to be effective in an even more urgent issues concerning society at large such as the effective Covid-19 emergency response and epidemic containment.

2. Against pandemic: think globally, act locally!(?)

The 2020 coronavirus pandemic is indeed a global problem of unprecedented magnitude since World War II for a major share of the population in many Countries worldwide. Surely, this is the case in Italy. The global reaction by state governments and international institutions worldwide accordingly has been unprecedented. In many Countries in the European Union national lockdown measures were introduced, starting from Italy on 9 March 2020, where the outbreak spread first with accelerating rates of diffusion; they followed soon after in other Countries, such as Spain and France, and most of other Member States thereafter.

When the national lockdown measures started in Italy, the outbreak was affecting different regions at quite different rates. Figure 1, shows the number of known cases (PCM-DPC, 2020) on 9 March 2020. Looking at the evolution of the outbreak in Italy, severe nationwide lockdown measures proved to be successful to date in order to slow down the diffusion. In Italian regions (and some EU Countries, such as Greece) where the lockdown started earlier with respect to the outbreak spread, the overall diffusion remained lower. Table 1 shows the diffusion growth between 9 March and 1 May 2020 by region.

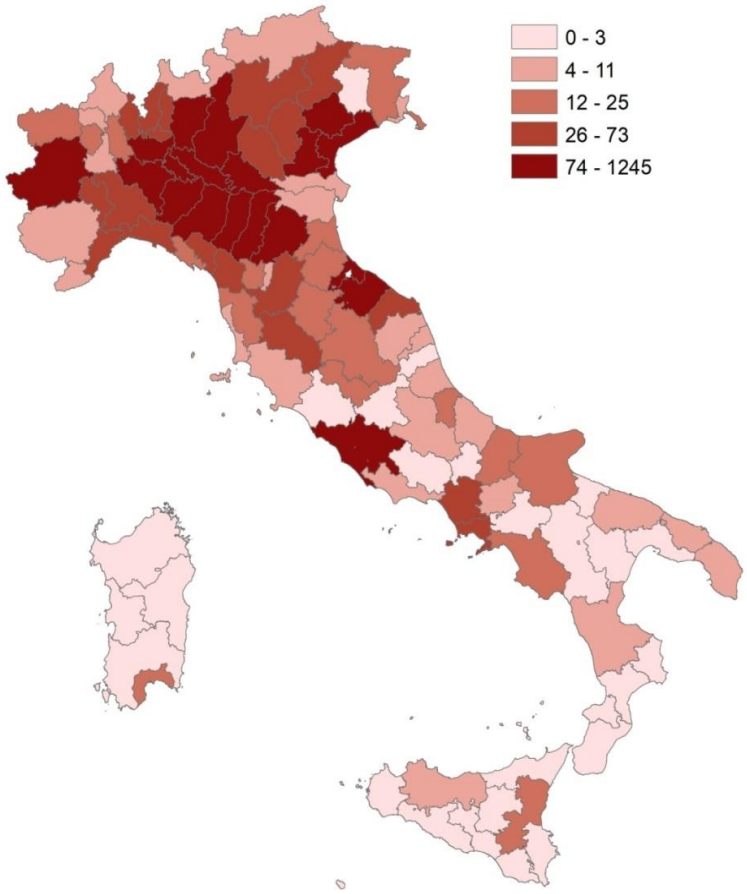


Fig.1 Distribution of coronavirus positive cases in the Italian Provinces on 9 March 2020

In Italy, in particular, looking at the number of positive cases in provinces, it is possible to identify four groups of provinces with similar behaviour along time (Figure 2). The blue group includes the provinces (i.e. Turin, Milan, Bergamo and Brescia) where the number of cases increased to the highest values (outliers).

Region	N° cases 9 March 2020	N° 1 May 2020	Increase 9 March - 1 May 2020	Population 2020	Area [sqkm]	Density [cases/sqkm]
Lombardy	5,469	76,469	71,000	10,060,574	23,864	2.98
Emilia-Romagna	1,386	25,644	24,258	4,459,477	22,453	1.08
Veneto	744	18,098	17,354	4,905,854	18,345	0.95
Piedmont	350	26,684	26,334	4,356,406	25,387	1.04
Marche	323	6,275	5,952	1,525,271	9,401	0.63
Toscana	208	9,445	9,237	3,729,641	22,987	0.40
Campania	120	4,444	4,324	5,801,692	13,671	0.32
Liguria	109	8,126	8,017	1,550,640	5,416	1.48
Lazio	102	6,672	6,570	5,879,082	17,232	0.38
Friuli Venezia Giulia	93	3,041	2,948	1,215,220	7,924	0.37
Sicily	54	3,194	3,140	4,999,891	25,832	0.12
Apulia	50	4,099	4,049	4,029,053	19,541	0.21
P.A. Trento	33	4,132	4,099	541,098	6,207	0.66
Abruzzo	30	2,948	2,918	1,311,580	10,832	0.27
Umbria	28	1,393	1,365	882,015	8,464	0.16
Sardinia	19	1,313	1,294	1,639,591	24,100	0.05
Valle d'Aosta	15	1,133	1,118	125,666	3,261	0.34
Molise	14	300	286	305,617	4,461	0.06
Calabria	11	1,112	1,101	1,947,131	15,222	0.07
P.A. Bolzano	9	2,528	2,519	531,178	7,398	0.34
Basilicata	5	378	373	562,869	10,073	0.04

Tab.1 Increase of Covid19 positive cases during lock-down (9 March – 1 May 2020; Source PCM-DCP, 2020)

The green group (Piacenza, Lodi and Cremona) includes those provinces where starting from high values the diffusion was somehow contained. The orange group, with a higher number of provinces than the first two, includes provinces where the number of cases started high but contagion containment was higher than the green group. Notably, the orange group includes provinces which are spatially contiguous with those with higher values, with the exception of the provinces of Pesaro and Urbino, of Rome and of Naples. The latter two represents spatial islands in the orange group; this might be explained considering their population size and density, and their territorial connectivity and centrality. Most likely territorial factors and dynamics may have an effect on the outbreak, as suggested by some with regards to climate and air quality (Bashir et al.,

2020). The red group represents the set of provinces (and regions) where the number of positive cases was very low when the lockdown started and the overall diffusion remained relatively low to date.
In addition, further focusing on response to emergency, as mentioned earlier in this paper, Covid19 epidemic in Europe affected Italy first at the beginning of 2020, followed by France, Spain, Germany and UK. As by March 9, 2020 The Italian National Government applied nationwide the same lock-down measures in the most affected provinces as well as in the less affected, with the number of cases varying between 1245 and less than 3. At that time, being the diffusion rates, and deriving risk, very high, information little, and understanding of the dynamics low, this was possibly the most pre-cautionary and sensible decisions. Indeed, the epidemic diffusion rates slowed down in the following weeks, and in those provinces where severe lock-down measure were applied at an early stage, numbers continued to be overall low, limiting the spread. The situation was though slightly different on 4 May 2020, when thanks to the reduction in diffusion rates, the National Government implemented the so-called Phase 2 of the Italian national response epidemic. Again the same identical measure were to be applied no matter the location, according to the National policies, and notwithstanding several Regional Governments (notably in the South of the Country and in two island regions) advocated the condition were favourable to the application of looser measures in order to re-ignite economic processes, reduce negative impacts on quality of life, and unbound personal right limitations. Whether the overly cautious approach of the National Government was the best choice also in phase 2 it may too early to be properly assessed. Nevertheless, whether the regional instances were also a possible sensible choice in the light of the potential social and economic benefits deriving from a faster realise of lock-down measure should possibly have been also matter of serious consideration, assessment, and planning and decision-making accordingly.

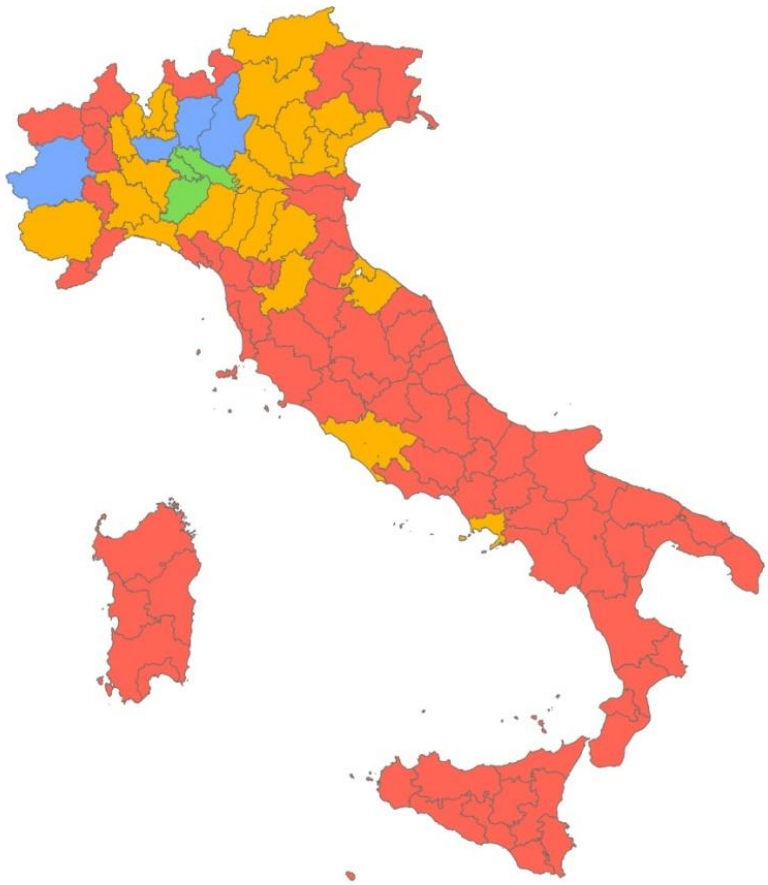


Fig.2 Groups of provinces with similar behaviour in Covid19 diffusion between 9 March, 1 May, and 30 May 2020 (Source PCM-DCP, 2020)

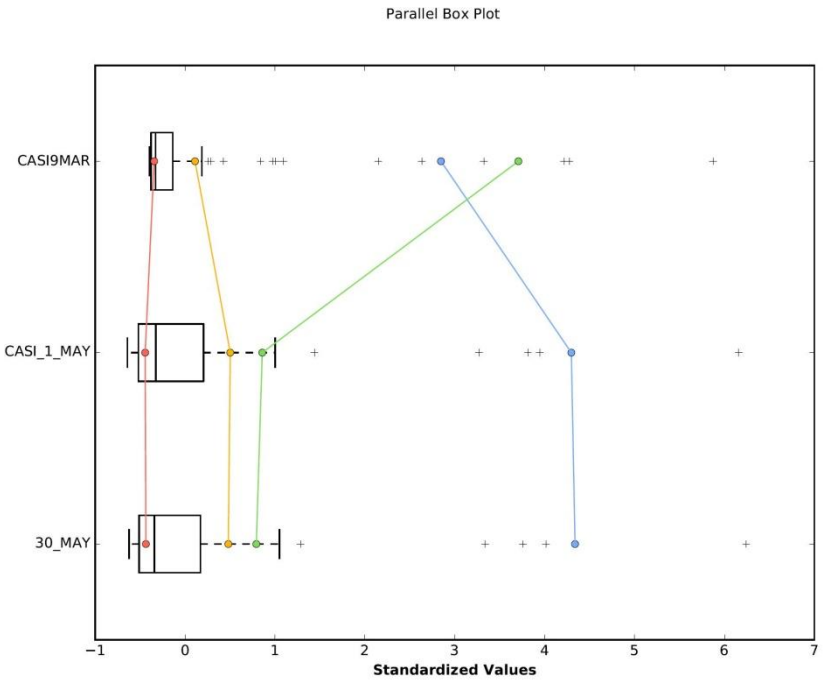


Fig.3 Distribution of positive Coivid19 cases in Italian provinces in 9 March, 1 May, and 30 May 2020 (Source PCM-DCP, 2020)

3. Common global vs customised local measures: the case study of Sardinia Italy

As further real-world example, the case of Covid19 epidemic in Sardinia, Italy during phase 2 of Italian lock-down in May 2020 will further underpin the analysis of potential values of a local, large scale, geographically grounded approach to emergency response, as detailed in this section.

Examining the regional ordinances issued in May 2020, there is no evidence that the Regional Government of Sardinia considered a local geographically based approach, notwithstanding advocating it for Sardinia itself at the National level, where considered for the lower level of Governments. Notably, the Sardinian Government allowed the municipal level the right of decision-making on the application of some selected measures following the National President of the Council of Minister 26 April 2020. Nevertheless, no evidence of a sound official regional planning associated to that decision was found. It should be noted that the facts are not reported here with criticism, rather the analysis of the evolution of the National, Regional and local responses to emergency is proposed aiming at contributing a further perspective taking into account the spatial dimension of the phenomenon, aiming at achieving a more careful balance between public health and socio-economic objectives in emergency response.

3.1 The spatial dimension does matter!

One of the underlying hypotheses in this paper is that the spatial dimension of the epidemic is not taken into sufficient account in emergency response. Indeed, no clear evidence in the available news, nor in available public documents have been found, with the noteworthy exception of using satellite geospatial data by the Copernicus Emergency Management Service mapping temporary health facilities (such as triage facilities, field hospitals and so on) as well the gathering places in Italy (Posaner, 2020). In principles, it may be the case, that other responsible bodies did use geospatial intelligence to plan and coordinate emergency response. Nevertheless, it is reasonable to assume this is not the most common case for the prospective actors which may make a contribution in addressing the emergency for several reasons, and among them low public data

accessibility, low diffusion of skills in understanding and analysing spatial data, low awareness of the usefulness of handling problems spatially among the many involved responsible actors as well as the whole community which may actually give a substantial contribution in mitigating the outbreak. To support this assumption, the following examples are given relying on use cases taken from the news or by the personal observation of the author during the epidemic in Sardinia, Italy. The twofold aim in providing these examples is ì) to demonstrate that the spatial dimension and geography matter at all scales, and ii) to provide practical hints for more responsive and thorough actions to those who can contribute in addressing the epidemic at various scale, but might currently, fully or partially, ignore the influence of considering the spatial dimension in making their decisions.

The general background assumption is that global strict measures calibrated to worse local hazard are possibly more cautious, but they also have higher and diffused negative socio-economic impacts on communities. Thus, a local custom approach may be the most sensible approach in some cases to achieve a balanced and sustainable emergency response, possibly reducing its evident secondary negative impacts on economy and society at large.

3.2 Regional scale emergency response planning

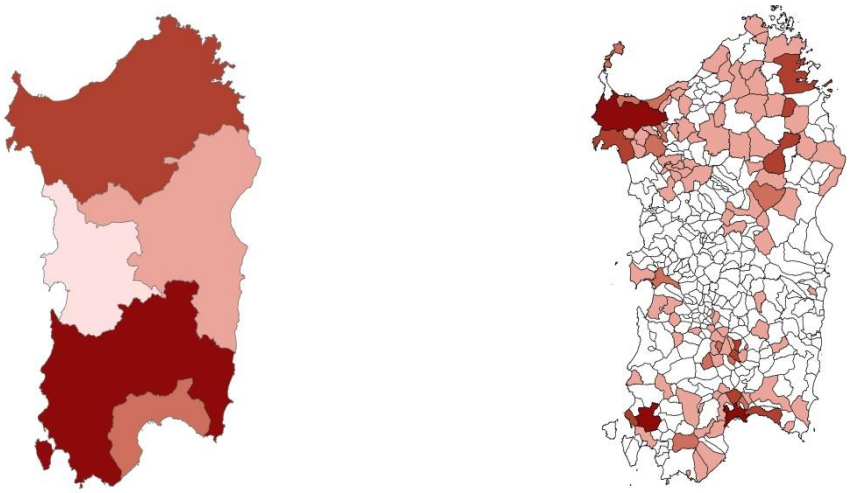
This example aims at showing how the change of scale from the province to the municipal scale may be of great help when planning emergency response at the sub-regional level. In an island region such as Sardinia, which include 377 municipalities, depending on the epidemic diffusion rates emergency response planning could possibly include such measure as differentiation of lock-down measures in different areas, and/or limitation in the flows of people between different sub-regions, and/or optimised organization of police control and enforcement in hot-spots. Indeed in Sardinia during March and April 2020, as reported frequently in the news, the Regional Forestry Corps patrolled coastal areas to enforce the deny of access to beaches to the public. The news reported the number of infringements, however no evidence was given where the patrolling activity took place. On the one hand, it is possible to assume that the enforcement took place in all beaches around the island, no matter whether the beaches were located in epidemic hot-spot or in areas with no evidence of epidemic presence. On the other hand, targeting beaches in epidemic hot-spot areas would have help to optimize the use of police force resources, achieving a more effective public control action. While it also possible to assume that the latter approach was adopted by police in organizing control, there is no evidence it was the case, making the government enforcement control activities no transparent to the public. In addition, regional orders regarding re-opening of beaches as well as other kind of economic and commercial activities to date where to be applied throughout the whole region, irrespectively of local epidemic diffusion rates. Is this the best choice?

In order to show how substantial local differences were in place, figure 4 depicts the situation of epidemic diffusion in Sardinia at the end of May 2020. The reader please be informed that the number of positive Covid19 cases by municipalities may be fairly inaccurate in the example as it was obtained by manual digitization process from a choropleth map of low accuracy issued by the ISS weekly reports, and the underlying ancillary data are not available to public. Thus, it should be considered "fictional" in strict terms. Nevertheless, it can used to show in principle the potential improvement achievable from the increase of data resolution from the province to the municipal level.

Figure 4 shows a) the distribution of cases at the province level, and b) the distribution of cases at the municipal level.

While in figure 4a it is possible to deduce that all island is overall affected by epidemic (actually with no dissimilar rates in order of magnitude), thus justifying no differentiation in local emergency response, Figure 4b show that actually several sub-regions in the island were, and many still can be considered substantially

Covid19-free, having had no official cases to the reference date. Thus, it is possible to assume, or at least to take it in serious consideration as an issue for further investigation, that while some measure may have been appropriate for some areas, they might have been released in others which constitute substantially wide sub-regions with no positive cases occurrence, possibly focusing on limiting the connections and flows between affected and not-affected sub-regions, while releasing movement limitations within not affected regions.



a) b)

Fig.4 Change of scale in Covid-19 epidemic data in Sardinia. Data may be inaccurate as they are obtained by manual digitization by the author (original static image source: ISS, 2020), however they provide an overall idea about the spatial pattern of the phenomenon (thus legend is omitted).

3.3 Local scale emergency response planning

The second example aims at showing the implications for local emergency response planning, and it is based on a random-generated datasets at the higher possible resolution, that is the point coordinates locations of cases. While these high resolution data can be, and surely are, collected by medical institutions assisting Covid19 patients, they are not discovered but in aggregate form, and given public access only at the province level, limiting the potential for analyses. In addition, while it is possible to assume that they could be also acquired by a large-scale citizens science initiatives aiming at mapping negative and positive cases, however so far no information about such kind of initiative was found.

Let us consider the official number of positive Covid19 positive cases in the Cagliari Metropolitan City (CMC), which includes 17 municipalities, and corresponding to the province level administrative boundary. In 25 May 2020, the CMC featured 249 cases. Figure 4b shows that the municipal distribution in the CMC was uneven so the same consideration made in the previous section can be applied to this case as well. In addition, when we look at data at the largest possible scale we can assume that in general different distributions may occur. The effect of an even vs biased distribution in space are evident if the aim is to calibrate emergency responses at the large local administrative (e.g. district, neighbourhood) or geographic scale. From the ISS weekly report is it possible to estimate approximately 150 Covid19 positive cases in the municipality of Cagliari (Figure 5a). In the example in figure 5 b, c, d different local distributions of cases, which are randomly generated in this case to assess the hypothesis, may help to adapt general containment measures to local districts or neighbourhood at the municipal level. Overlaying large-scale data with other spatial data themes may be of great help in understanding the local dynamics and planning emergency response.

Fig.5 Hypothetical distribution of local cases: a) Metropolitan City of Cagliari, b) Cagliari: random generated even distribution, c) random generated uneven distribution, d) random generated uneven distribution and land-use.

3.4 Large scale common citizens' behaviour

An example taken from real-life experience by the author is used to demonstrate how geography matters in applying social distancing rules up to the largest scale with implications for planning and design. Social distancing measures were proven to be one of the most powerful mean for containing the viral diffusion, and the period of strict lock-down containment is a sound proof. There is a common general agreement that two main rules would help to reduce interpersonal probability of contagion, namely maintaining an interpersonal physical distance of at least 1 meter (or 2 meters in the case of outdoor sport activities), and using personal safety devices (i.e. mask) indoor and in any situation in general where the physical distance could not be ensured. Let us focus on the case of outdoor sport activities, as in the example in figure 6, which depicts a multilane track for sport activities along the seaside in Cagliari. As by 4 May 2020, Italy entered in containment

phase 2. Accordingly, sport activities as well as walking were allowed back after two months of restriction. Many people, after two months of strict home confinement took the chance to do some sport and enjoy the pleasant spring weather.

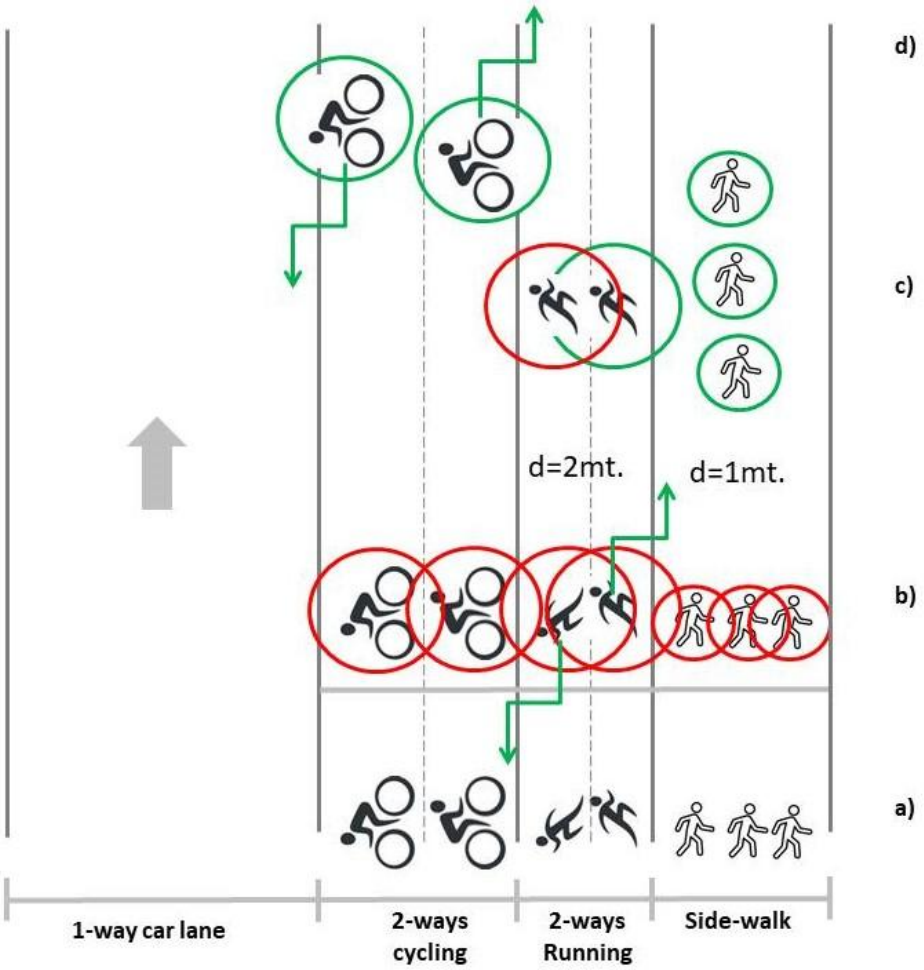


Fig.6 Influence of distancing in outdoor sport activities (i.e. cycling, running and walking)

The new rule according to the public ordnance for outdoor activities was to maintain the interpersonal distance of 1 meter, or 2 meter in case of sport activities such as running or biking. Section a) in figure 6 depicts the common situation in pre-Covid-19 times: the physical dimensions of the multi-lane track would allow two bikers and two runners to occupy the same section in parallel, as well as up to three-four pedestrian in the sidewalk. With the introduction of social distancing, the physical dimension of the lanes would require to change behaviour as depicted in figure 6 b-d. While common sense would possibly lead individuals towards the smart application of the new rules, this is not often the case, and in reality the situation depicted in section b) and c) in figure 6 (in red) was observed very frequently. This very trivial example aims at showing that the application of an apparently simple distancing rule as "maintain distance x from others" may be not as effective as it should in reality. In such situation, further guidelines, paying attention on how the rule application may require change of personal behaviour in space would be probably appropriate. Developing such kind of guidelines would probably be a specialty for architect and engineers. In fact, such detailed rules were widely communicated to the public with regards to other simple behaviour such as hand-washing and handling masks, so their importance should be not underestimated, in the face of the overall fallacy of the common sense of the crowd.

4. The possible contribution of Geodesign to emergency response

Among possible approaches to Coiv-10 outbreak response planning, geodesign in principles may be of help. As argued by Steinitz geodesign as a methodology approach may help to handle the complexity of territorial phenomena (2012).

In geodesign a number of characteristics of the methodology are indeed relevant:

- Scales matter: as in any design issue scale matters, and as in any planning and design problem, geodesign may help to adapt the design of emergency response and containment measures to local geographic and physical conditions at all scale, as discussed in the previous section;
- Systems-thinking: Covid-19 outbreak is very likely to be related to environmental phenomena and addressing a complex problem by systems may help relating epidemic risk to other environmental systems such as air, transport infrastructures, settlement density, and allegedly others;
- Geodesign is holistic in bridging science and design: in that, it may help to provide methods and tools for collaborative multi-disciplinary design, integrating knowledge stemming from design, science, information and communication technology, as well as from the local community (i.e. the people of the place) to address emergency response;
- Offering interactive computational models, it allows to devise alternative solutions for action and contextual impact assessment in very short time (compared to other design methods), allowing to quickly adapt design solutions to the rapidly evolving conditions of emergency.

Fully digital geodesign workshops were recently tested by the author in same-time/different place mode, demonstrating how fast the design process can be implemented relying on internet group-ware technology such as the geodesignhub (www.geodesignhub.com) web-based planning support systems and Zoom (www.zoom.us) teleconferencing platform, enabling a high number of participant/experts (i.e. 30 and more) to address complex planning and design problems as fast as in half-a-day time.

5. Final considerations

Covid-19 pandemic is an outbreak of unprecedented magnitude, but is not he first one afflicting regions worldwide in the last decade.

The impetuous and rapid diffusion is interrelated with current globalization in environmental and socio-economic dynamics, and according to many, to the current state of the terrestrial ecosystem including climate change. If this hypothesis will turn to be true, we might expect similar phenomena might occur again in the short-medium term. As a precautionary approach suggests, we would better to be ready, as the risk are highs and possible implications catastrophic.

Hence, the question is: who can contribute to effectively address this unprecedented, poorly understood, and very complex challenge? For sure such specialist as virologists, epidemiologists, and physicians will play, as they are doing in the current state of things, a major role. However, if the spatial dimension of the phenomenon is so relevant as it seems to be, at all scales, as briefly the author tried to argue here with some preliminary examples and reflections, the role of (geographers and) spatial planners and designers may be as much relevant in planning emergency response supporting spatially informed decision-making as well as developing guidelines and protocols to be applied by single individuals and communities.

In summary, a number of issues for urgent research emerge for spatial planners and designers from the preliminary reflections proposed in this paper, including but not limited to:

- Data collection
- Data availability (and relating privacy issues)
- Spatial analysis (if large scale geographic data are made available to researchers and planners)

- Planning and design
- Communication to the public

Indeed, shading light on the issues above in the unprecedented context of pandemic urgency might help to contribute, together with the findings and recommendations originating from other the disciplines involved, to help achieving a more holistic and comprehensive response to the complex emergency we are facing nowadays, and to others we might expect to experience also in the future as territorial dynamics become global and often unexpectedly fast.

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Image Sources

All figures are original produced by the author for this paper.

Author's profile

Michele Campagna

He is professor of spatial planning at the Department of Civil, Environmental Engineering and Architecture (DICAAR) at the University of Cagliari. His main research interests include Geodesign, Metaplanning, Planning Support Systems (PSS), Spatial Data Infrastructures (SDI), Volunteered and Social Media Geographic Information (VGI/SMGI).