Why a disaster risk management perspective may be useful for the multiple challenges associated to the management of Covid 19 pandemic

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1. Introduction

In recent decades, the issue of how knowledge in disaster risk reduction can be shared and co-produced by different stakeholders and with the larger public has become key. A number of EU funded projects have been devoted to understanding how knowledge developed in particular by researchers can better inform decision makers in a number of societal domains, certainly in advancing strategies for reducing communities vulnerabilities to a variety of natural and man made hazards (and the mix of the two such as na-techs) and for increasing the capacity to adapt to the consequences of climate change and become more resilient to severe shocks[1]. It has been suggested that this paradigmatic change in the way knowledge is developed, disseminated and shared requires a number of relevant steps. First the recognition that there are multiple types of knowledge, not only scientific but also organizational knowledge, that is related to how complex organizations work and how they are enacting knowledge that is provided by individuals who are part of the organization in relation to the knowledge that is developed collectively. Another layer concerns the institutional knowledge regarding how scientific and technical knowledge is translated into social norms and legal regulations. Last but not least, citizens' knowledge that is the large body of information, data, believes and interpretation of all mentioned bodies of knowledge based on content available in different media, including nowadays social media. Whilst different types of knowledge can be broadly associated to different social groups, it must be also recognized that in a complex world, a person has different types of knowledge in his/her different roles. A researcher has for example scientific knowledge regarding his/her own field of expertise, but for all other domains he/she shares with many other persons citizens' common knowledge, albeit filtered through his/her level of education. But he/she is not an expert in other domains. This has to do with the complexity of our society, as expressed by McGlade and van den Hove (2013, p. 415): "It is unsurprising that planning and management institutions have been unable to respond to crises or change, as in many instances, the organizations are suffering from a chaotic mixture of information, analysis and interpretation with no paradigmatic structure in which to incorporate all the various forms of scientific, interdisciplinary, and indigenous knowledge." In a post-modern society (Ravetz and Funtowicz, 1999) individuals are receiving information from an enormous number of sources. "In this way we can see a form of second-order science emerging in which individuals must rely on other peer groups and experts to be able to evaluate the information within their own domains of expertise" (McGlade and van den Hove, 2013, p. 415).

Environmental problems, related for example to the impacts of natural and man made hazards, to climate change, require a highly mixed and interdisciplinary set of expertise and different knowledges. This need goes into the opposite direction to that experienced in the last two centuries when disciplines have significantly developed through specialization at the expense of the understanding of how such expertise is framed within the more global challenges of knowledge and action. Problems at the frontiers of traditional domains of expertise are coming to the forefront. They require a rethinking of how scientists, governments, practitioners, different types of organizations both public and private work, produce and share knowledges. Whilst specific competences will continue to be relevant and essential, there will also be the need to advance

[1] For example one can consider the FP7 Know4drr (www.know4drr.polimi.it); Horizon 2020 Placard Interchange (https://www.placard-network.eu/)

in the creation of mixed groups of people with different types of knowledges converging on the frameworks of complex problems and on their solutions. Interfaces do not exist only between scientific fields, but also within different types of knowledge and among persons enacting such knowledge. Boundaries and barriers exist between the interface between scientists and decision makers or policy makers. The acknowledgment of the difficulty scientists experience in consulting for decision makers has been debated for long time in the natural and technological risks domain and highly relevant research has been developed (Salter et al., 1988; Jasanoff, 1990; Funtowicz and Ravetz, 1990; European Commission, 2007). What has been understood and sometimes practiced in the natural and technological hazards domains can be very relevant to tackle the dreadful challenges of the current pandemic crisis, especially as regards the need to tackle effectively what Carlile (2004) identifies as the "political or pragmatic boundary", where knowledge needs to be transformed through negotiation and new forms of agreement among actors must be found.

2. The need for scenario based planning

There were several documents of the WHO and other international organizations warning about the possibility of a pandemic and offering tools for planning (WHO, 2005, 2009; Global Preparedness Monitoring Board, 2019). In a document of the U.S. National Intelligence Estimate (2000) it was clearly stated that "epidemiologists generally agree that it is not a question of whether, but when, the next killer pandemic will occur". Guidelines and a skeleton of plans were available at the WHO (2016, 2017, 2018) and at national level in many countries. Yet the current global crisis unveils severe weaknesses on the side of planning in many countries even on the first crucial chain of intervention, i.e. the rapid deployment of medical personnel, the re-adaptation of hospitals to treat an infectious disease and the provision of medical protection devices for those who most need them, such as hospitals staff, doctors and vendors in pharmacies, etc. Some pandemic plans were only formal documents just developed to comply with legislation or as a follow up of a recently experienced epidemic but were not operational enough as officials and stakeholders in charge did not really train to implement them. Investigations on this will certainly be part of the following interpandemic phase at all levels, at the local level in individual hospitals, elderly care facilities, municipalities, at the regional and national level, and certainly the UN level including the WHO. Already now documents are brought to the attention of a larger public by media reporters. In the United States, for example, a document of the Pentagon issued in 2017 was depicting a scenario that is strikingly similar to that faced globally today; in Germany, a national risk assessment of 2012 predicted the course of a SARS-CoV pandemic in good agreement with current events, however with a three-year period for vaccine development and as many as 7.5 million deaths (Deutscher Bundestag, 2013); in the Lombardia Region, an audit document following the A/H1N1 virus (Regione Lombadia, 2010) highlighted the many deficiencies of the regional health care system in coping with a pandemic and proposal for improvement were foreseen, albeit in a rather synthetic fashion, but not properly followed up.

As researchers in the natural and man-made disasters domain, we know that this situation is not specific to pandemics but rather general; in the aftermath of many disasters the weaknesses and fragilities of institutional arrangements and the lack of credible plans are often pointed out as the main cause of the disaster. Yet too many plans are not based on comprehensive scenarios, addressing not only the hazard characteristics but also the exposure and vulnerabilities of communities and assets. The COVID19 crisis differs from other recent viral epidemics not only as a medical challenge, but only because of the dramatic changes in social and economic vulnerabilities caused by globalisation and an ageing society. Multiple scenarios should be the base of any credible emergency plan, possibly preparing also for low probability/high impact scenarios considering that the more an organization is developing the capacity to think (even though not fully able to cope with) of unprecedented and critical events the better it will prepare for them, at least putting in place that minimal level of response that is needed especially in the first stages of a crisis (Lagadec, 2007). We know from our own experience working with civil protection organizations in developing different types of plans (Menoni, 2013), including those for Seveso installations, that they are generally reluctant to consider scenarios that are particularly nasty, defeating their capacity to handle the resulting consequences. Their underlying justification is that such “extreme” scenarios are not foreseen in approved documents and official studies. This behavior can be understood considering the potential legal consequences that are explicitly considering an extreme scenario for which it is very hard or even impossible to fully prepare for, given limitations in budget, human resources, and sometimes just because the potential impact is simply overwhelming. Therefore, in order to try avoiding later legal consequences, some scenarios are simply dismissed. However, this approach is leading to ineffective plans, based often on old studies that are not valid anymore given the fast dynamic of many hazards but also due to changes in societies and in the built environment. This situation is not limited to one country or another though. There are several examples that showed the limitations of preparedness in large but also relatively less severe events, ranging from response to Katrina (The White House, 2006), the 2011 Fukushima disaster (The National Diet of Japan, 2012), but also less known or catastrophic ones in Finland, Romania, Italy (Turoff et al., 2013).

Whilst devoting huge resources for any possible scenario is not advisable neither, still there is a large margin for improvement in the way comprehensive scenarios are prepared and emergency plans developed. This would require though a significant change in the way bureaucracies but also organizations both public and private see their mandate and their responsibilities as knowledge purveyor with respect to the different carriers of knowledge, i.e. communities, businesses and individuals, in a post-modern society (Ravetz and Funtowicz, 1999).

3. The need for multi-sectors approach in scenario development across multiple temporal and spatial scales

The forthcoming “Science for DRM 2020: acting today, protecting tomorrow”, led by the JRC-DRMKC, has taken an openly multi-sectors approach in dealing with the impacts of hazards. Traditionally mainly the impact on houses and buildings was considered, now the focus is on all sectors that are actually impacted, including agriculture, industries, commercial activities, services, lifelines, cultural heritage, natural systems. Such multisector approach is essential in order to grasp the real impact of events that may also significantly vary from one place to another given the mix of exposed assets and functions. A further development that has been sought particularly in the last years refers to the need to investigate not only the direct physical damage that disasters provoke, but also indirect impacts, a category that actually comprises a broad number of second and higher order impacts (Rose, 2004) due to the systemic interconnections among components of the same system and among different systems (Menoni et al., 2017). The more complex the built environment the more interconnected are systems, creating ripple effects that may amplify or instead reduce the overall impact significantly. Generally, in the natural hazard domain or in industrial accidents, the direct physical harm to people and assets is considered the first link of a complex chain of impacts; second and higher order consist for example in business interruption, in the malfunction of critical infrastructures and services, social discomfort, traumas suffered by individuals and communities especially if fatalities occurred. Longer term damage can be also resented as reported in more recent articles (Dupont and Noy, 2015). Damage and losses are generally associated with the hazard occurrence. Following Van der Veen and Longtjmeier (2005), systemic damage is the consequence of physical damage that has occurred to a component of a system coupled with systemic vulnerabilities that relate to how complex systems function, to their mutual interdependency, to the impossibility to transfer some functions from one place to another, and to the lack of redundancy. However, it is well known in the field of natural hazards that mitigation measures that are put in place to reduce damage and losses entail costs too. This is a less explored field of study, most cost benefit analyses developed insofar consider structural measures, so the cost is that associated to their construction and maintenance overtime. However indirect costs exist as well, also for structural measures. In the case of flood both temporary measures (flooding agricultural areas to save cities) and permanent (constructing containment basins upstream to protect assets and infrastructures downstream) may have significant costs for communities that must bear them without enjoying the benefits. There are also cases in which indirect damage due to measures is much larger than the direct physical damage. Global threats are of this kind. One may recall the Eyjafjallajökull eruption that provoked little physical damage to the built environment in Iceland, but halted all civilian flights in the Northern Hemisphere for a week, with overall losses that have spread over the globe given the impossibility to transport some perishable goods by planes (Oxford Economics, 2010).

In the case of the present pandemic, the direct physical damage is the number of fatalities it caused in all countries. The costs of the measures that have been taken insofar to flatten the curve so as to avoid peaks of patients overwhelming the capacity of treatment of the health care system are likely to be very high. There is the direct cost associated to the closure of economic activities and services. As many economic activities are affected at the same time across all sectors, it is already very hard at this stage to evaluate the total amount of such costs country by country (OECD, 2020). Second and higher order damages are likely to be much higher, but how much exactly is very hard to tell. As experts in the field we can say there is no established methodology for assessing such costs. Second order damage can be considered those related to interruptions of several supply chains, systemic effects due to the drastic sudden stop of the purchase of many goods and services. Higher order damage may be considered the longer term losses that will be probably unevenly suffered by different social groups and economic activities in each country and by some countries more than others. But how exactly requires more than a rough projection over the GDP, also because in such a large global lockdown, systemic interconnections between economic and financial aspects at different spatial scales may produce unexpected consequences that are hard to foresee. There is a certain level of agreement among experts in economy that duration of the lockdown is a crucial variable. As for small businesses there are studies that have assessed the critical duration. For example, a report of the Association of Italian Insurance and Reinsurance Brokers (AIBA) has estimated that 40% of small and medium businesses that could not resume activity within 3 months after the event closed within the successive two years (Unipol, 2014).

Whilst in the first emergency, given the general lack of a credible and usable plans rough measures of closure have been imposed, in the recovery there will be the need to find much more fine tuned measures, to keep low the infection rate but at the same time resume activities and services. Certainly some sectors will suffer much more severely and for longer period of time; tourism activities are the most blatant example. The share of the latter on the overall balance of some countries is so large that it is relatively easy there to assess the overall impact of the measures to contain the pandemic.

Whilst in the first emergency the costs of the measures were not really a matter of debate, in the longer term for the next future they need to be. The consequences in terms of unemployment rates, breakdown of firms and even entire sectors are very hard to estimate with accuracy, yet they are likely to be significant, especially in some countries, in some regions. Such losses may have a not negligible impact also on public health, as already experienced during the financial crisis 2008-2013, and that were due to the measures that have been taken to combat it (Karanikolos et al., 2013). The overall argument of the uncertainty in assessing the costs, both direct and indirect, is certainly not new in the field of natural hazards. Especially regarding indirect costs the difficulties in appraising them have been raised by several scholars (Pfurtscheller and Schwarze, 2008; Hallegatte, 2015; OECD, 2018).

The benefits of the measures are fraught with uncertainty too. The Imperial College report has carried out a first attempt to compare the measures against the curve of new infections. However, such comparison needs to be brought at a lower scale assessment level. In order to carry out a meaningful cost benefit analysis, different options and different alternatives should be compared. Therefore, the effect of more finely tuned measures, tailored to different types of activities and ways of production and service delivery should be compared. However, of course, no figures are available at this stage, although the effects in terms of costs could be significantly variable. One of the problems that we envisage in the current management is the separation of consultant teams on medical and economic affairs as if the two were not addressing the two sides of the same coin. Instead, the assessment of measures to mitigate the contagion should be discussed against their costs. Otherwise it is pretty obvious that experts in the medical domain wish to stay on what they perceive as the "safe" and cautionary part of the balance. In addition, we need to say that even experts in the largely considered "medical side" are not in full agreement. Differences in opinions may be even large between medical doctors in the first line, working in intensive care units and in hospitals, epidemiologists, who have a more statistical understanding of the disease, but not close to individual cases, virologists who study the characteristics of both spread and characteristics of the virus as an agent displaying specific features in terms of biology and mechanisms of spread. In such conditions typical for complex risks where both the uncertainties and the stakes are high, grounding decisions on scientific facts is not straightforward, as the facts are disputed by the scientists themselves (Waltner-Toews, 2020). Furthermore, as correctly put by Calabrese and Bobbitt (1978), experts are such on the matter of the dispute but not on the choice itself.

Focusing on the knowledge that only a discipline can provide is problematic because experts in one field are not necessarily as knowledgeable in other fields and may not consider alternative options that can still achieve a sustainable result in terms of number, frequency and rate of infections albeit in a more economically and socially sustainable way. This is similar to the situation in which geologists are asked to provide advice regarding acceptable land uses in hazardous areas. The recommendations polarize on two opposite sides of the scale: acceptable or total limitation of any land use. The result in the case of natural hazards, is that limitations are either neglected or bypassed. In the case of this infection, partly because of the novelty, partly because of the fear that has been instilled in the public to make it comply with the norms, partly because of the fact the measures have been imposed with varying levels of force, overriding has been very limited insofar.

4. A data management issue

One of the reasons why it is difficult to fine tune measures relates also to the lack of solid, reliable tools and methods to collect and manage data, even on the infection itself (Callaghan, The Lancet March 25 2020). In the era when data are everywhere, pervasive and implied in virtually any activity of our life, still the lack of good quality, useful and reliable data has to be lamented in many fields. The issue of disaster related data has been at the core of important initiatives carried out by the European Commission since 2012 when the first workshop on the topic has been organized with relevant international organizations including the United Nations, FEMA, and the World Bank. Since then significant effort has been invested into improving the quality of post disaster damage data, as an important pillar to sustain several disaster risk reduction policies (Marín Ferrer, 2018) and to be able to assess the indicators measuring the level of achievement of the Sendai Framework. In order to be able to evaluate whether disaster risk reduction measures have been effective at the national, regional and local level, a data collection and management mechanism must be put in place and maintained overtime. The Technical Group based at the JRC (De Groeve et al., 2013, 2014) has also highlighted the need to guarantee a certain level of comparability and harmonization among at least the European countries, because otherwise any attempt to develop sustainable finance mechanisms for catastrophes, and to verify the level of compliance with European Directives, such as the Flood Directive, will be hampered by a lack of common basis against which to assess any new effort or initiative. An example that is closer in nature to the pandemic faced today, relates to the heat wave that hit Europe in August 2003. Official estimates of the excess death toll attributable to the extreme heat and to the lack of preparedness to take care of the most vulnerable (an aspect critically similar to the one faced in the current Covid 19 pandemic) are not available (Robine et al., 2008).

As the benefit of current measures must be measured in terms of reduced fatality rates, it is crucial to understand if in different countries and even regions and states in the same country, causes of mortality are assessed on equal criteria; furthermore also death toll as a percentage on total number of infected is likely to be missing as the latter number is not currently known and difficult to get even when antibody tests will become available. As in the case of post disaster damage data, the issue is not that data are not collected or difficult to get. In fact, it is mainly an issue of fragmentation, discrepancies in definitions and protocols that nevertheless imply very high costs, as return to a more normal life will be impossible if there are no mechanism of surveillance and monitoring that will provide the possibility to check how many new infections occurs and to project from them how distant a country or a region is from the threshold or the response capacity of the health care system. Also, the argument that doctors and nurses overwhelmed by their duties cannot collect data is rather obvious, albeit too similar of that reported by first rescuers and firemen in the aftermath of an earthquake. Nevertheless, the issue is not to further overwhelm responders that are already acting above the limit of tolerance, but to put in place organizational mechanism that permit to collect data that are vital both for later stage of the recovery and for the same researchers who need to better understand to real spread path of the pandemic.

The same issue of lack of empirical basis on which to project estimates of direct and indirect damage to economic activities that has been already highlighted for natural hazards is common to the case of pandemics, for which we lack solid frameworks and models to assess the real economic costs that will be incurred by different sectors (Madhav et al., 2017). The majority of models that economists use for example are designed to depict systems, supply chains under ordinary conditions or under stress that is not single, sudden and rapid onset (Menoni et al., 2017).

Concluding remarks

Challenges that we are facing globally are certainly very high, especially if considered as a compound of complex issues and problems stratifying at all spatial and governmental levels and with several retroactive and feedback loops across economic and societal sectors. Though as correctly put by Yates and Paquette (2011) “a disaster often can be viewed as not only one large emergency, but multiple ‘mini-crises’ or catastrophes that emerge over a period of time”; lack of means and resources to address each of those single crises will inevitably result in overall failure. Some tools and methods suggested in this paper could provide relief and capacity to handle the current pandemic such as improved interdisciplinary work, facilitated processes to build interfaces between experts, decision makers, and different segments of civil society, coordinating efforts with NGO, grassroot organizations that are much better at communicating with communities with respect to central governments. Tools and methods to collect disaster data in a structured and coordinated fashion could support already overwhelmed civil protection and health organizations, putting in place arrangements that could rely on alternative methods for collecting crucial data on patients, trajectories and hotspots of infection.

Regarding the need to asses alternative management options against their costs and fully appraising their benefits requires a much more advanced capacity to blend different types of knowledges with respect to what has been the case until now. A comprehensive cognition of the crisis and its potential direct, second and higher order impacts in the short and the long time is clearly lacking, especially by those who would mostly need it: decision makers and governmental organizations. More coordination should be foreseen also at the European level, leveraging on past projects that have brought to work together administrations and cities across Europe in an effective way for climate change mitigation and adaptation projects. The experience developed by such projects could be now capitalized to share practices, problems and solutions.

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