Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Contents lists available at ScienceDirect

Urban Governance

journal homepage: www.elsevier.com/locate/ugj

Resilient urban governance: Adaptation and innovation in the face of the Coronavirus pandemic

COVID-19 pandemic as a "super-wicked" problem

The pervasive, unpredictable, and unmanageable outcomes generated by the coronavirus pandemic portray many features of what have been defined as "super-wicked" problems (Levin et al., 2012). In this regard, defeating COVID-19 is not the only issue. The main problem is, rather, how to make our societies more resilient also to possible similar kinds of viruses that might affect our lives in the near future, provided the structure of the socio-economic and ecological systems where we live.

As noted by Levin et al. (2012, p. 124), 'super-wicked' problems "comprise four key features: time is running out; those who cause the problem also seek to provide a solution; the central authority needed to address them is weak or non-existent; and irrational discounting occurs that pushes responses into the future. Together these features create a tragedy because our governance institutions, and the policies they generate (or fail to generate), largely respond to short-term time horizons even when the catastrophic implications of doing so are far greater than any real or perceived benefits of inaction".

Urbanization and pandemic

Nations around the world are struggling to contain the COVID-19 pandemic and withstand its social, economic and psychological shocks. Urban and metropolitan areas have been hit hardest due to their population density, close economic linkages, and massive public transportation (Kraemer et al., 2020; Liu, 2020). This new normal is not only likely to persist but also may become more pervasive over time.

We are living in an age of epidemics where new viruses and new pathogens are emerging. What are driving the rise of new infectious diseases? Climate change is one major culprit. Another is the expansion of urbanization itself that brings humans into closer contact with wildlife and squeezes animal habitats. Humans are transforming the planet's natural habitat at an unprecedented rate. Fifty percent of the world's population live in urban areas, that will grow to 70% by the year 2050, according to the United Nations. Urban areas pack people together more closely, often in polluted and unsanitary environments. As they grow, urban areas encroach on previously wild or rural ecosystems. Urban expansion also drives development. Land-use change seems to be a particularly important driver in two directions: either a sudden deforestation of an area, or a reforestation next to a place where humans are living. We are putting people in contact with species that they may not have had contact with before. Once that contact is established, urbanization can play another role, a density of people living next to each other that potentially facilitates the spread of the virus. It is not cities per se, but the rapid changes that we have not accounted for—land-use change, rapid increases in crowding, and decreases in sanitation—are particularly worrisome combinations of traits for the spread of pathogens.

Unpacking urban resilience

Whether the outbreak of any virus is going to grow in geographic scope and size to become an epidemic, or a spill across borders and affect multiple jurisdictions at once and become a pandemic, really depends on how we respond and how quickly we recognize the events that are happening. How well urban regions around the world adapt themselves to the new normal will be a test of their resilience—the city's ability to overcome unprecedented and life-threatening events in the external environment. Urban resilience also represents various ways in which urban governance systems respond to destabilizing disturbances (Sharifi, 2019). A multiplicity of social economic, organizational, and physical conditions affects the urban capacity to bounce back. A wide range of stakeholders has been involved in the pandemic responses and recovery planning (Jabareen, 2013). In the face of the COVID-19 pandemic, resilient urban governance needs to adapt itself to extraordinary situations by identifying and assessing the virus risk, reducing vulnerability and exposure, responding, and reopening social and economic activities.

This symposium "Resilient Urban Governance: Adaptation and Innovation in the Face of the Coronavirus Pandemic" is a collection of five papers that explore this topic via theoretical, empirical, and comparative lenses. We refine Coleman's (1990) framework into a macro-meso-micro characterization to offer a window into the logics underpinning this collection of papers, premised on the assumption that one must account for the role of human agents when theorizing about the mechanisms that explain meso and macro-level associations.

Urban resilience from a system/network perspective

In "Urban Resilience for Building a Sustainable and Safe Environment", Kapucu, Ge, Martin & Williamson (2021) first trace the trajectory of its conceptual development, and then argue that the attractiveness of the term resilience should be understood in comparison with other terms that are used in scholarships on urban environment, such as vulnerability, sustainability, and adaptation, in response to climate change. They posit that the rise in popularity of the term resilience is associated with

https://doi.org/10.1016/j.ugj.2023.01.003

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its positive connotation compared to the notion of vulnerability (potential points of failure). Yet we would like to point out that resilience is not simply the opposite of vulnerability, but represents the ability to manage existing or new vulnerabilities so as not to allow them to overwhelm us. When it comes to sustainability, there is also a time dimension that one needs to consider. Sustainability has a long-term perspective whereas resilience is more short-term-oriented.

Their definition of urban resilience represents a systematic perspective embedded in a dynamic process. They define it as "the ability of an urban system—and all its constituent socioecological and socio-technical networks across temporal and spatial scales—to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity" (p.10), as well as "Urban resilience refers to a multidimensional dynamic process among stakeholders aiming to prepare and adapt the urban environment to absorb and recover from external and internal disturbances and reduce urban vulnerabilities." (p. 12). The latter definition also reveals their efforts to bridge macro-micro levels: macro levels refer to the social, institutional, economic, environmental, and infrastructure dynamics whereas micro levels point to stakeholders (managers in public, private, and nonprofit sectors and organizations, policymakers, and researchers). Building resilience requires collaboration between all levels of government, businesses, and nonprofit organizations, and other stakeholders.

In "Building Urban Infrastructure Resilience through Network Governance", Kapucu, Hu, Sadiq & Sadiq (this issue), further expand the concept of urban resilience into the domain of network governance. Collaborative networking provides a powerful engine to cope with one of the main challenges that "super-wicked" problems imply: decision makers in a single public sector organization do not control all the choices required to alleviate the problem.

Urban resilience in the lens of network governance refers to "the ability of an urban system—and all its constituent socioecological and socio-technical networks across temporal and spatial scales—to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity" (Meerow, Newell, & Stults, 2016, p. 39). With interdependence in mind, the paper explores the research question: "How can the resilience of interdependent urban infrastructure systems be enhanced through multi-level and multi-sector stakeholder collaboration and mobilization of community resources through network governance?" (p. X). The article reviews the current state of scholarship on resilience with a specific focus on partnerships and stakeholder engagement for building meso-level urban and community resilience. Key ingredients of network resilience as a meso-level outcome are proposed to be influenced by collaborative leadership, stakeholder interactions, governance structures as micro-level contributing factors.

Equally important is to identify and examine the innovative practices exemplified in resilient urban governance amid the pandemic. This new normal makes it necessary for urban governance and its stakeholders under different contexts to develop and pursue policies and managerial choices that are different from those in the past, creating the opportunity for experimentation and innovation. To this end, Kapacu & Hu illustrate their framework with an example of Texas Winter Storm in 2021.

In "Resilience, Fragility, and Robustness: Cities and COVID-19", Hunter (2021) pivots to the idea of fragility, defined as "a city's weakened capacity to govern and manage threats" (p. 2). Different from vulnerability as the unavoidable threat of the virus transmission before the declaration of the pandemic, fragility is understood as "an administration's failure to mitigate this threat through appropriate lockdowns or an effective social safety net" (p. 3), often referring to failed states or governments when facing the uncertain economic, social, or military factors. Hunter draws our attention to the failure to address the underlying fragility, such as systemic inequalities, to the detriment of the city's ability to function, despite the significant investment that has been made in improving resilience. In the event of the COVID-19 pandemic, this pre-existing fragility directly affects the city's resilience by decreasing the city's ability to absorb the unforeseen shock.

Like the two previous papers, Hunter also employs complexity theory as a point of departure to conceive of city as complex adaptive ecosystems that are both dynamic and self-organizing. Just like organic and natural complex systems, not only does the interaction between human components spark self-organization and adaptability, but human components shape the physical components of a city as ideas and thoughts become roads, buildings and physical artifacts. Urban ecosystems consist of resources, processes, people, institutions and activities, which interact with each other on a daily basis to bring a city to life. Dynamic processes between actors and objects, whether top-down or bottom-up, emerge into patterns that are eventually articulated as networks.

After a comparative analysis of three case studies during the COVID-19 pandemic (Melbourne, New York City, Milan – Lombardy), he pinpoints how government hierarchy as instances of fragility in developed cities can affect a city's ability to respond to crises. He then articulates the concept of robustness to help cities improve resilience and decrease fragility. Robustness shifts the focus from cities as reactive and static systems to cities as dynamic, pro-active and predictive systems, not only capable of absorbing a shock, but capable of sense-making before a shock occurs and adapting and maintaining the same level of system functions. This pandemic unveils and magnifies the social, economic, health disparities across regions, among cities as well as urban residents. He puts forward a social compacts as the implied agreements between government and individuals, such as the norms, traditions and laws that bind society, to address underlying disparities.

Micro-level urban resilience

The last two papers shift their attention to the micro level. When the pandemic hits, many cities in the developed countries performed poorly not only because they did not know what to do, but also because they did not know what should be prioritized. Biswas, Arya & Arya (2021) develop "A quantifiable framework for 'Covid-19 exposure' to support the Vaccine prioritization and resource allocation for resource-constraint societies".

In "Health communication and trust in institutions during the COVID-19 lockdown in China's urban communities", Yang & Huang (2021) underscore trust as one of the most delicate but critical requirements for an effective pandemic response. Trust is a glue that holds everything together. Trust in institutions is fundamental to civilization. In this pandemic, like so much else, success in public health has depended on both the public's trust in government and in a shared social contract among citizens (Elgar et al., 2020).

First, trust in government is an important dimension of how well societies have responded (Yan et al., 2021). You can imagine if a government in power tells their people to do one thing, and they do not believe the government, they are not going to do it. Government policy matters, but individual behavior sometimes matters more. When lockdowns and mask mandates started in early 2020, they were largely effective. But their effectiveness varied, depending on how seriously people took the rules. Second, building trust on biomedical science proves to be especially challenging. Before the pandemic, it might have been assumed that safe vaccines offering high levels of protection against a frequently fatal and society-altering disease would be in high demand. In some places, they have been, but in others vaccine skepticism has limited demand. When several pharmaceutical companies announced vaccines within a span of several weeks, hopes soared that we could reach herd immunity quickly. That dream was no match for the realities of vaccine hesitancy. Around the world, a significant part of the population declined to take the vaccine.

Trust is hard to manufacture during a crisis. Yet Yang and Huang provide us with some hope by demonstrating that heath communication matters in China. They found that traditional authoritative communication has increased the public's trust in both community administrators

and scientists. Interactive communication via social media is detrimental to trust in scientists and increased trust in administrators when used effectively.

Bridging macro-meso-micro levels

The research on urban resilience bears relevance at macro, meso, and micro levels of analyses. However, more research is needed to link these three levels. Responses to the challenges posed by the COVID-19 pandemic, highlight the ways in which macro intersects with meso and micro levels. Macro research typically investigates questions related to how the broader economic and social environment influences micro-level outcomes. Micro studies often examine the factors and dynamics that influence individuals' affect, behavior, choices, and cognition. Meso analysis falls between the macro and micro levels, such as city, community, and group. It is particularly useful for conceptualizing the connections necessary to craft a robust, integrated analysis that bridges macro, meso, and micro levels. Consequently, developing research that seeks to bridge these levels has the potential to facilitate better understanding of complex challenges and potential solutions for addressing them.

Taken together, these contributing papers to the symposium not only make clear how a complex systems approach is needed, but also showcase potential opportunities for bridging macro, meso, and micro research in both directions—using macro perspectives to contextualize meso and micro processes, and exploring how micro phenomena aggregate to explain meso and macro outcomes. This calls for future researcher to address why, when, and how a macro-level construct impacts the community and individual perceptions, cognitions, emotions, or decisions that are the focus of their work. In other words, the task is to develop theory about how context shapes meso and micro-level associations. In addition to taking the most salient environmental cues into account, meso and micro scholars might also consider situational factors that create opportunities or constrain community, group, and people's behavior. Community, group, and individuals' actions may also be determined by a combination of different contexts. By bringing three levels into closer dialogue with each other, we can avoid de-contextualized, reified, and atomized views of urban resilience.

Research challenges and opportunities

To address "super-wicked" problems, policy makers should adopt a dual perspective. While, on a side, prompt decisions are needed in a short-medium run to control (through problem mitigation and prevention) the vicious and pervasive outcomes that such problems generate, on another side collaborative policies are also needed to prepare the field for gradual changes into the structure of the system that has generated unsustainable outcomes: this is the core of transition management and governance. Transition policies are tailored to provide the "seeds" for establishing new initial system conditions that, through facilitated stakeholders' learning and collaboration, might enhance path-dependent performance outcomes in the long run. Such policies should challenge those societal values and dominant beliefs that, embedded in their socio-economic and ecological systems, have been a main cause for a collective behavior that has produced unsustainable outcomes.

Path-dependent policy analysis should characterize efforts aimed at mitigating, preventing, and counteracting "super-wicked" problems – such as in the case of the COVID-19 pandemic – in a way that the global and local dimensions of such problems can be consistently faced, to pursue sustainable societal outcomes. Adopting policies based on a system and proactive view may allow stakeholders to discern how inertial changes (e.g., in public values and societal behavior) can be fostered through earlier decisions, "having both a constraining, or "lock-in" effect and an opportunity-enhancing effect" (Bardach, 2008, p. 348).

This requires framing inertia, and focusing on collaboration to build trust, and to challenge possible dysfunctional public values, with respect to sustainability. A holistic approach to societal transition towards balanced co-evolution and resilience of socio-economic and ecological systems needs a medium-long time horizon, which also implies addressing inertial changes and related intermediate outcomes in a short-medium time frame. To this end, cross boundary performance dialogue and adaptive co-management provide powerful drivers of change, which impact on collaborative networking initiatives characterized by long-term collective policy design, that may "trigger and nurture path-dependent processes that lead to transformative change over time" (Levin et al., 2012, p. 131). Performance dialogue and adaptive co-management are fundamental drivers of behavioral change in the society that may counteract an "irrational discounting" associated with an inclination to mildly perceive the negative future outcomes that currently – latent, weak, or inconsistent – adopted policies will generate, with respect to "wicked" problems.

All these efforts may generate the conditions for a gradual change in the societal system structure, which is a prerequisite for entrenching people support over time on the adopted transition policies. This is also a fundamental condition for expanding the population base (Levin et al., 2012, p. 129-130) which actively participates into collaborative programs aimed at strengthening such policies through co-design, co-production, and co-assessment of the emerging outcomes (Bianchi et al., 2017). Therefore, enhancing trust in government, civic mindedness, and social capital – as building blocks of active citizenship – provide the basis for generating intermediate outcomes which may sustain transition policies in the long-run.

Leveraging mitigation, prevention, and transition policies on a local basis through different and interconnected time scales may sustain global policies aimed at taming "super-wicked" problems, such as COVID-19. In fact, it may empower policy makers with empirical and focused lenses to effectively deal with such problems, based on the specific challenges of the different contexts where they originate. This is also helpful in dealing with the problem of lacking multi-level governance consistency.

Identifying and affecting performance drivers – as "leading" indicators of future performance (Otley, 2012, p. 252), and therefore of community outcomes – provides the involved stakeholders substantial insights for outlining policies that may inertially lead to path-dependent effects, impacting on resilience and sustainability. The "performance driver" concept, broadly used in performance management, becomes a very useful means to implement performance governance. In fact, it enables decision-makers to outline and "fine-tune" transition policies by selectively and promptly perceiving weak signals of strategic change originated by the deployed shared strategic resources at societal level. For instance, the number of vaccinations can be a function of different performance drivers, such as: the perceived transparency of shared information, or the perceived limitations that missing vaccinations would imply. All such performance drivers allow policy designers to outline consistent logics through which strategic resources will be built up and deployed to affect the end-results, in terms of output (e.g.: vaccinations) and outcome measures (e.g.: infections, deaths, sick leaves, and lockdowns), which in turn impact on shared strategic resources (e.g.: health, trust, and financial condition of local businesses).

Therefore, identifying and monitoring performance drivers might suggest the need of adopting changes to the originally designed policies, in order to counteract the emerging adverse effects – possibly by extending the investigated system boundaries, which entails involving more stakeholders in policy analysis. This is the basis of a feed-forward mechanisms that would boost strategic planning & control in such inter-organizational settings. Such an approach is framed by Dynamic Performance Governance (Bianchi, 2021; Bianchi et al., 2021).

Through Dynamic Performance Governance, policy analysis can be enhanced to investigate on the role that risk and uncertainty play in affecting community outcomes. In particular, it helps stakeholders challenging the risks of an illusion of control (Dermer & Lucas, 1986) by extending the domain of policy design from the *known of known* to also

the *unknown of known*, as well as the *known of unknown*, and the *unknown of the unknown* (Otley, 2012, p. 253). The last two dimensions require dialogic performance governance and a double loop learning process, possibly in the context of collaborative platforms (Ansell & Gash, 2018; Ansell & Miura, 2020; Bianchi, 2022).

A fundamental shift of policy paradigm

But even if the world does manage to end the COVID-19 pandemic, we cannot just breathe a sigh of relief and return to business as usual. That means the next pandemic could be just around the corner. This pandemic has been very severe. It has spread around the world extremely quickly and has affected every corner of this planet, but this is not necessarily the biggest one. Overall, the collection of papers in this symposium suggests that in the COVID-19 era, a city's strength is determined not only by its economy, but also by its resilience—capacity to absorb systemic shocks, adapt to these disruptions, and quickly bounce back from them. To achieve urban resilience, we should also need a fundamental shift of policy paradigm from "increasing efficiency" in industry and society of the 20th century, to "investment in more redundancy and contingency planning" in the 21st century, a prudent hedge against future risks, even at some cost to efficiency.

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