A Systemic Resilience Response to Covid-19

A Submission to the Resilience Commission

OECD New Approaches to Economic Challenges (NAEC) Initiative

Systemic resilience is needed to deal with the SARS-CoV-2 pandemic and future shocks…

System resilience is a term of rising popularity during the SARS-CoV-2 (Covid-19) pandemic. Rather than only a buzzword, however, resilience is both a philosophical and operational goal – prioritizing the capacity for a system (e.g., infrastructure, acute medical care settings, the local environment, and countless others) to recover from and adapt to a vast array of potential future threats. In this way, the strategic advantage generated through resilience thinking is by viewing the dependencies, incentives, and critical functions of complex systems, and making sure they have capacity for expeditious recovery *regardless of the acute or chronic disruption they may face.*

Governments worldwide hold the ability to adopt a systemic, anticipatory approach to reinforcing resilience as a response to the interconnected challenges facing modern societies. These challenges, such as natural hazards, aging population, global migration, and digitalization are compounded by their potential to disrupt cyber, information, societal, and infrastructural systems with lasting consequences. Traditional approaches of risk assessment and management focus primarily upon hardening systems so that they can absorb threats before breaking. Absorption of threats is still essential to uphold societal safety and prevent losses, yet is not sufficient to guarantee continued system survival once the system or its operators are faced with constraints or stressors beyond battle-tested operating capabilities.

Approaches that solely emphasize system hardness to threat are inappropriate, prohibitively expensive, or both for many of the issues governments will have solve. The systems approach promotes cross-sectoral, multidisciplinary collaboration in the process of policy formulation by accounting for the crucial linkages between issues generally treated separately within different specialisations and scientific and institutional "silos". To promote positive social and economic change, a range of policies must be integrated including educational, demographic, employment, well-being, technological, and innovation policies. Systems thinking provides a methodology to better understand the behaviour of complex systems and to improve the assessment of the consequences of policy interventions.

…because the world economy is becoming more interconnected and complex…

Growing complexity and interdependence have made various systems (economic, public health, cyber, for example) susceptible to widespread, irreversible, and cascading failure. Serious disease outbreaks such as COVID-19 are the result of systemic properties such as emergence in particular. Emergence describes a process whereby a situation arises through the interaction of multiple actors and influences without any intention to create that situation. Helbing (2013) and others have noted that the consequences which involve the failure to appreciate and manage the characteristics of complex global systems and problems can be immense. A recent paper published by the UK Royal Society (Johnson et al. 2020) shows that emerging infectious diseases in humans are frequently caused by pathogens originating from animal hosts and that virus transmission risk is highest from animal species that have replicated and even expanded their range by adapting to human-dominated landscapes. Impacts on ecosystems due to changes to socioeconomic systems, such as the introduction of intensive agriculture, play a role in creating or aggravating epidemic risk. One study which examined the emergence of infectious diseases calculated that since 1940, intensive agriculture has been associated with more than 25% of all infectious diseases that emerged in humans and more than half of all infectious diseases that spilled over from animals to humans (Rohr et al. 2019).

Striving for maximum efficiency and optimisation, such systems have neglected resilience against disruptions (Marchese, 2012) whose shocks may leave governments, the public, and the environment in a weakened state. More specifically, the concentration of industrial capacities and economic activity into smaller and more efficient sectors, up to the international level, has produced highly lucrative yet fragile supply chains and economic exchanges whose disruptions could have sweeping effects in unexpected areas. While this has provided considerable opportunities, it has also made the systems we rely on in our daily lives (e.g., international supply chains) vulnerable to sudden and unexpected disruption, as the result of either an external shock, the way the system has self-organised, or a combination of both (Juttner and Maklan 2011; OECD and FAO 2019). For example, the 2011 earthquake and tsunami in Japan exposed the limits of just-in-time supply chain organisation, and highlighted the importance of flexibility, diversification, and adaptability (Fujimoto 2011; Golan et al. 2020).

…leading to cascading and irreversible failures

Such risks have been thoroughly described by leading economists and scholars since the onset of the 2007–2009 financial crisis, yet primarily in an abstract context, although Andrew Haldane, the Bank of England's Chief Economist, did argue in 2009 that, "the spread of epidemics and the disintegration of the financial system – each is essentially a different branch of the same network family tree" (Haldane 2009). Therefore, a key question is not focused upon whether systemic risk would cause substantial, cascading losses to the international economy, but rather on what type of disruption would trigger such a chain of events in the first place?

Resilience offers new approaches to policymaking…

Resilience has been a focus of specific parts of public administration, for instance military and public health authorities. Resilience must become a core philosophy within system management and operation to ensure these systems are able to continue to function despite disruptions like Covid-19. Rather than rely solely upon the ability of system operators to prevent, avoid, withstand, and absorb threats, resilience emphasises the importance of recovery and adaptation in the aftermath of disruption.

…to prepare, absorb, adapt, and recover from shocks…

Such a mind-set acknowledges that the infinite universe of future threats cannot be adequately predicted and measured, nor can the effects be fully understood. Resilience acknowledges that massive disruptions can and will happen and it is essential that core systems have the capacity for recovery and adaptation. Consideration must be given not just to hardening the healthcare system but a range of critical systems connected to it. This involves examining how risk is absorbed and mitigated by these systems, and subsequently how affected systems will recover, adapt, and preferably "bounce forward" (Linkov et al. 2018a, 2018b; Ganin et al. 2016, 2017).

…such as the SARS-CoV-2 pandemic (Covid-19)…

The Covid-19 outbreak has led to a crisis with considerable cascading losses for public health but also for much of the global economy, with concordant high social costs. National governments are struggling to absorb the shock generated by the pandemic, but in time the international community will overcome the crisis and begin the recovery phase. The crisis reveals how important it is to keep resources in reserve for times when unexpected upheavals in the system prevent it from functioning normally (and the argument can be made for not depleting natural resources). Given the interdependence of our economies and social systems, the pandemic highlights the need for strengthened, evidence-based international cooperation (building on existing frameworks for emergency preparedness) to tackle systemic threats and avert systemic collapse.

…with specific policy recommendations to enhance systemic resilience…

Based on OECD NAEC reports and the resilience literature, specific recommendations for building resilience to contain epidemics and other systemic threats include:

1) Ensure that systems, including infrastructure, supply chains, economic, financial, and public health systems, are designed to be resilient, i.e., recoverable and adaptable

2) Develop methods for quantifying resilience so that trade-offs between a system's efficiency and resilience can be made explicit and can guide investments (Trump et al., 2020)

3) Control system complexity to minimize cascading failures resulting from unexpected disruption by decoupling unnecessary connections across infrastructure and making necessary connections controllable and visible

4) Manage system topology by designing appropriate connections and communications across interconnected infrastructure

5) Add resources and redundancies in system-crucial components to ensure functionality, and

6) Develop real-time decision support tools integrating data and automating selection of management alternatives based on explicit policy trade-offs in real time (Hynes et al. 2020)

…by design and by intervention…

How is Systemic Resilience generated? Fundamentally, the processes are organised in two distinct, yet interrelated, ways. First, the capacity for Systemic Resilience may be driven by exogenous resource allocation passed on from one entity onto another by intervention (i.e., building up stockpiles, transferring resources to people, bailing out firms), or it may be stimulated through endogenous self-organization by design.

Resilience-by-design builds the capacity for a system to recover critical functions after a disruption within the structure of the system, such as the expansion of telehealth during the coronavirus pandemic. Such strategies include redundancies, in contrast to efficiencies as described above, and involve structuring systems to reformat and recover without external inputs or aid. Resilience-by-design provides for a self-sustaining system. Systems involving rapid exchanges of information are foundationally required to foster elements of resilience-by-design, where capacity for identification of threats, assessment of losses, and self-reorganization allow a disrupted system to persist, recover, and even bounce forward when disrupted.

Resilience-by-intervention presumes that an external resource will be available as needed to support system resilience. The external resource may be an umbrella resource available to any number of systems under the right conditions, such as with disaster aid conferred from national governments to regions or municipalities. A system that transfers the cost of resilience to another entity may be more agile, efficient, and risk tolerant in its normal operations. However, such offloading may only be advisable under certain circumstances when there is sufficient trust to assure that the resources will be made available as needed.

Ideally, complex social and economic systems should have a measured capacity for both. Unfortunately, however, economic recovery has largely hinged upon resilience-by-intervention alone, with sizable capital outflows via government stimulus on behalf of society, such as those policies that seek to preserve financial liquidity and backstop threatened economic sectors.

…but this requires precision in timing and implementation.

Such interventions may have considerable lasting benefit to national and international economic health, but they suffer from twin limitations: (i) alone, the cost of intervention may rise above and beyond the political or market threshold to carry stimulus-oriented debts, and (ii) the success of interventionist policies is predicated upon impeccable timing and a precise identification of *where* to intervene. The latter is particularly concerning, for a misplaced financial intervention may yield poor stimulus returns or even inhibit long-term sustainability in job creation, sectoral growth, and international trade.

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