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.

Environmental Science and Policy 138 (2022) 146–148

Contents lists available at ScienceDirect

Environmental Science and Policy

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

Are our data ready for the next global challenges? Resilient data for resilient societies and economies

Michael Schaepman [a], Matteo Tarantino [b,c,*], Sheila Aggarwal-Khan [d], Nikola Biller-Andorno [e], Giacomo de Giorgi [f], Jacques Ducrest [g], Peter Messerli [h], Mamokgeti Phakeng [i], Volker Türk [j], Markus Stoffel [k]

[a] University of Zurich, Switzerland
[b] University of Geneva, Switzerland
[c] Catholic University of Milan, Italy
[d] UN Environment, United States
[e] University of Zurich, Switzerland
[f] IEE/GSEM, University of Geneva, Switzerland
[g] State Secretariat for Education, Research and Innovation, Switzerland
[h] University of Bern, Switzerland
[i] University of Cape Town, South Africa
[j] Executive Office of the Secretary-General at the United Nations Headquarters in New York, United States
[k] University of Geneva, Switzerland

ARTICLE INFO

Keywords:
Data
Resilient societies
New challenges
Covid-19

The waves of the COVID-19 pandemic have visibly shaken a wide range of national systems and infrastructures: from health to welfare, from environment to security. This shaking has exacerbated dangerous fragilities which were already exposed by the aftermath of the 2008 economic crisis and climate change, including nature loss, shrinking habits and growing toxicity and pollution. While a relative newcomer in the 'crises club', by grinding the world to a halt for months, COVID-19 has highlighted that our ability to build resilience into our systems still has considerable ways to go. So how do we respond? We have been hearing a lot about 'bouncing back' – that is, returning to pre-COVID conditions – as the core objective. However, in a number of contexts, and particularly for the global South, *returning* appears less desirable than using this crisis for *advancing* sustainability agendas. In both cases, a key question is: how do we make sure that inattention to the triple planetary crisis of climate, nature and pollution (with dimensions ranging from land cover change to hostile species invasions) do not lead us to the next round of shocks? How do we move from'esponse mode' to 'pre-emptive mode'? In other words: how do we increase the resilience of our societies?

While tragic, challenging and extremely urgent, COVID-19 can be addressed through approaches which are not available for the concurrent challenges we are facing. For the latter, we do not have something akin to vaccines; we may have some ingredients, and we need to build on them.

A starting point may be the adoption of a proper systemic perspective. The challenges the world is currently facing – institutional, humanitarian, economic, climatic, informational, pandemic – cannot be addressed in isolation. Rather, all these systems appear tightly interlocked and interdependent. To put it bluntly, it is not anymore about choosing between people and nature, development and well-being, prosperity, and fairness; now it is about pursuing all of them through cross-sectoral policies. This is not only a matter of ethics: COVID-19 has shown that inequality is a structural vulnerability and liability of any societal system. Unfair, unequal systems are simply not resilient enough.

* Corresponding author at: University of Geneva, Switzerland.
E-mail address: matteo.tarantino@unige.ch (M. Tarantino).

https://doi.org/10.1016/j.envsci.2022.10.006
Received 18 March 2022; Received in revised form 12 September 2022; Accepted 6 October 2022
Available online 17 October 2022

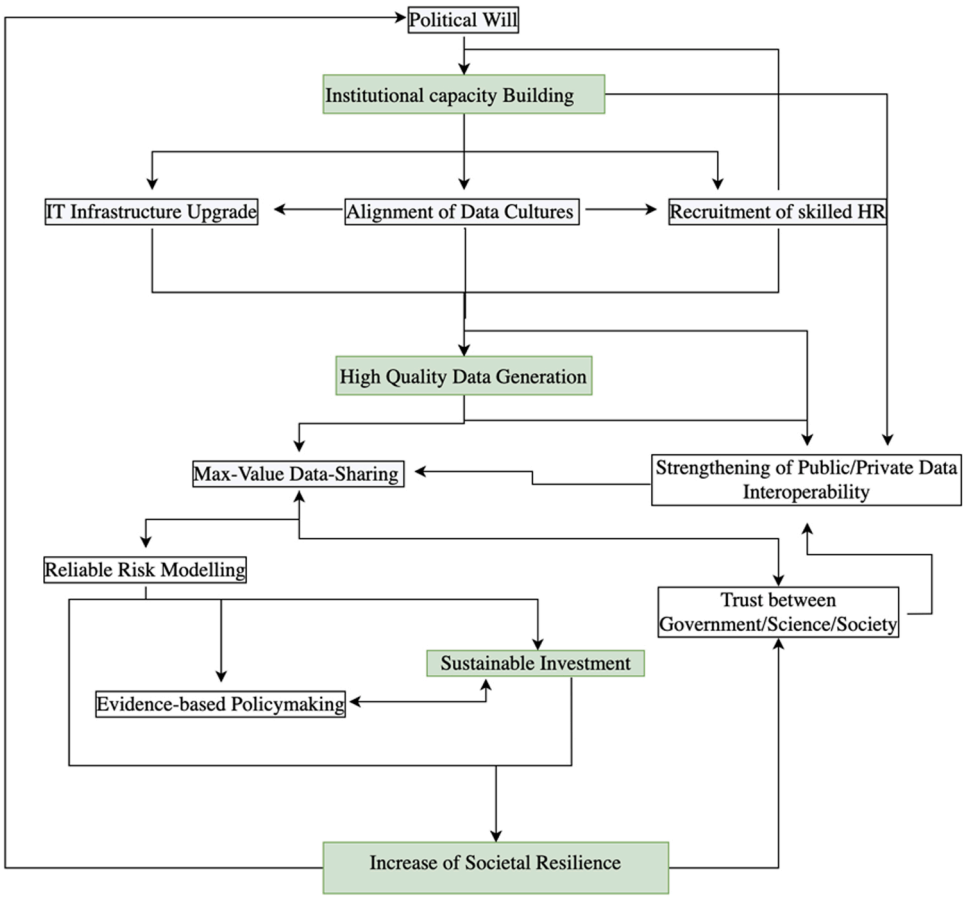

Fig. 1. Flows of change towards resilience.

Across countries, institutions and even individual systems, the 20th century mantra 'grow first, clean up later' increasingly appears as an untenable strategy.

Addressing the complex scenarios emerging from these interlocking challenges will require new forms of governance. Transversal approaches and agile public policies are required. We can identify four fundamental, shared lines of action. First, policies should prioritize future-proof actions, able to address the coming shocks and risks; therefore, they must rely upon modeling that is not only robust in terms of foresight accuracy, but flexible (and daring) enough to include future compensations alongside current ones. Second, trust relationships between governments, citizens and science must be established or mended, and anyway carefully maintained. Communication and participation are key elements in this endeavor. Third, transformations should be driven by solid evidence to avoid short-sightedness and inequality. And finally: that public and private finance flows to those investments which are restorative and rebalance our relationship with nature and climate.

All four lines depend on a steady, continuous supply of reliable data from a variety of domains and disciplines. This should not surprise us. Data has long transcended being a topic for statistics specialists, spending their days in ivory towers to be consulted upon ad-hoc necessities. Rather, data has come to permeate the whole decision-making process, almost in real time. In this sense, it is becoming increasingly vital to attend to data ecosystems as public resources and a public good.

In other words: to build resilient societies we need resilient data ecosystems. Data ecosystems connect (through data pipelines, coherent data policies and aligned objectives) data producers across private and public entities. This organic interconnection is costly and difficult to both establish and maintain, besieged by frictions at all levels, and its benefits may not be immediately visible. Thus, it often ends up being an afterthought and other objectives such as performance and novelty are prioritized. This is also because institutional data infrastructures naturally tend to develop over time by stratification, rather than by a top-down unified design.

Indeed, globally, these fragmented data infrastructures have shown to be just as fragile and vulnerable to pandemic shocks as other critical infrastructures. According to a May 2020 survey on the impact of COVID-19 on national statistical offices conducted by the UN's Statistics division and the World Bank, during the pandemic 96 % of national statistical offices failed to maintain their data pipelines fully operational, due to the impossibility of fieldwork and face-to-face interaction.

Understandably, rapid adjustment has proven challenging; but it has also been hindered by long-standing challenges. A first challenge lies upstream and regards data availability in key areas, which may be scarce, dispersed and/or of insufficient quality or detail. For instance, this is the case of poverty data in many countries, be it through imputation (i.e. using proxy data) or direct surveys. There appears to be good promise in bringing in new sources of data from non-traditional sources; for instance, highly granular data about consumption or movement of goods and people from the private sector. However, this inflow needs to be respectful of privacy and security, as well as systematic and efficient. Specifically, to avoid increasing fragmentation and dispersion, it needs to prioritize interoperability over immediate performance. Finally, bias in data collection objectives and methods must be carefully weighted to avoid building complex systems to basically confirm our existing views and prejudices.

The second core challenge lies downstream, in what these data are supposed to do to advance sustainability agendas. Data ecosystems need to be oriented towards packaging data into compelling cases to direct policy and investment decisions towards sustainability objectives. Here we come back to the issue of trust, but also of interoperability and incentives. Data ecosystems need to be appropriately connected to

governments, civil society, academia and enterprises so that they are able to assimilate data and can use it to find solutions. In this sense, resilient data ecosystems can accelerate two vital collaborations: the collaboration between science and decision-makers to jointly develop new solutions; and the collaboration between public and private institutions towards future-oriented missions. Critically, the data ecosystems must spotlight new investment opportunities and track the flow of financing to them, while weeding out those investments – such as in coal fired power plants – that reduce resilience and well-being. The global COVID-19 stimulus projected spending (USD 16 trillion) represents one such opportunity; and with total capital formation of roughly 20 % of GDP per annum, there is wide scope for shifting financial flows to those investments that build rather than erode the resilience of economies.

Resilient data ecosystems for resilient societies, then; but the shaping of such ecosystems can only emerge from multilateral, inclusive dialogue which effectively engages voices from all strands of global society. The current health crisis is global in nature and requires a global response. This means that our endeavor to shape resilient societies cannot limit itself to certain regions of the world but shall integrate the entire international community. We will be resilient to global challenges only if the global south is also resilient to these global challenges.

In the end, the good functioning of a systemic approach hinges on reliable interactions and feedback loops: within and across regional and national boundaries, academia, international organizations, governments, civil society and the private sector must help each other establish and maintain them. Otherwise, we may arrive unprepared to the next global shock, with dire consequences for the future of the planet (Fig. 1).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

No data was used for the research described in the article.