Do we really need to think outside the box so often?

COVID-19, cascading disasters, global perspectives, integrated care and public health priorities

Crisis management and models from foreign policy analysis
COVID-19 and Cascading Disasters

Professor David Alexander
In 2020 Sir Oliver Letwin published his book ‘Apocalypse How? Technology and the Threat of Disaster’. It was widely read and appreciated in the United Kingdom. The book describes an imaginary but highly plausible scenario in which, on New Year’s eve 2037, a space weather event knocks out the UK National Grid. By this point in time the UK has become highly reliant on integrated networks in which virtually all forms of infrastructure depend on the supply of electricity from the grid. It is five days before the current can be restored and, in the depths of midwinter, the biggest problem is the protection of many frail elderly people, given the absence of mass communication, lighting, heating and almost all forms of transportation.

One might take issue with Sir Oliver on the grounds that the scenario was, if anything, too comforting. Total loss of the National Grid would probably take longer than five days to rectify, and if the earth is struck by a Carrington event (the effects of a major coronal mass ejection on the Sun), electrical transformers and navigation satellites would probably be seriously damaged, a problem that would require considerably longer than a week to rectify. Despite these cavils, the book conveys a remarkable understanding of the processes of government during a major crisis. However, what is perhaps most striking is that a crisis of appropriate magnitude occurred just as the book appeared in print (it was launched on 5th March 2020).

Ever since then, we have had to live with the effects, and the uncertainties, of the COVID-19 coronavirus pandemic. Clearly, this is not like the disasters that occur every year, and quite unlike a space weather catastrophe. There is no direct damage, but there are massive casualties and huge disruptions to the normal processes of daily life. COVID-19 could be termed a ‘wave disaster’ because of the tendency of the infection rate to ebb and flow. As much depends on a combination of emerging variants of the pathogen and dynamic changes in human behaviour and decision making, the immediate future is remarkably unclear, and so are many elements of the recovery process.

One factor remains important in all of these considerations: modern society is already highly dependent on networks. Never in the history of humanity has there been such interconnectedness as there is now, and it tends constantly to increase. Letwin noted that the high cost of redundancy induces even more dependency upon single networks, as it discourages the creation, use or maintenance of alternative systems.

‘Critical infrastructure’ is critical because life-support systems, productive activities and the conduct of daily life depend on it. Electricity is at the root of the various categories of critical infrastructure (which number from seven to 11 depending on how the classification is made). Fuel, water and sewage cannot be pumped without it, refrigeration of food requires it, and so does banking, which is now totally reliant on electronic transactions. All forms of mass communication use electricity and remarkably few of them are able to operate in any form without a mains supply to power equipment or recharge batteries. Soon, transportation will be fully reliant on electricity as its primary, or only, fuel.

Network failure is a constant risk in the light of the threats of cyber-attack, technological breakdown, extreme natural events or widely propagated malfunction. Many technical experts are at work protecting networks or ‘hardening’ them against attack or breakdown. However, protection can never be absolute. There is always room for disaster to strike—but concurrently for lessons to be learned from the risks and impacts involved.

On the face of it, the COVID-19 pandemic may not seem like a network disaster, other than through the person-to-person mechanism by which infection is spread. However, there are many aspects of this crisis that involve networks. For instance, curtailment of the seasonal migration of workers has left fruit and vegetables unharvested in fields for lack of sufficient labour.
Meanwhile, ‘front-line’ workers in the logistics field of warehousing and distribution of goods, and in public transportation, have been unduly exposed to infection, but at the same time, the stay-at-home society has become critically dependent on front-door deliveries and the conveyance of key workers to their places of employment. In Britain during the first wave of COVID-19, care home workers who were constrained to work at several sites carried infection from one to another and thus spread the disease among the frail and elderly, whom government and society had failed to protect adequately. Similar situations prevailed in, for example Sweden and Italy.

As we all know only too well, COVID-19 has caused drastic mutation to occur in our most familiar networks. Reduction in social contact, prohibition on assembly and gathering, reduced travel and leisure opportunities, and substantial changes in commuting patterns have not only profoundly altered daily life but they have posed serious questions about how we will conduct it after the threat of disease has returned to normal levels.

For the purposes of this discussion, the main point is that all modern disasters are, to a greater or lesser extent, cascading events. The dependency on networks is one element of this. However, a defining characteristic of cascading disasters is the presence of escalation points.

These occur in the chain of consequences when there is significant interaction between different kinds of vulnerability. The result can have Gestalt—i.e., the whole can be greater than the sum of the parts, or in other words, there can be secondary impacts that in some cases are greater than the triggering event.

In mid-March 2020 some 60,000 people attended the annual festival at the Cheltenham Racecourse in England. This was one of several events held around this time at which there was no social distancing and no requirement to practice disease risk abatement procedures. It undoubtedly speeded up the spread of the disease. Similarly, in August 2020 the regional government of Sardinia opened nightclubs and discotheques for five days, until permission was rescinded under pressure from Italy’s central government. A few weeks later there was a spike in COVID-related deaths that could plausibly be a result of this action. These are examples of simple escalation, representing the intersection between epidemiological risk and the desire to limit the social and economic consequences of the crisis. More complex examples arise from the varied policies of countries concerning international travel, quarantine, global tourism and regulation of the hospitality industry during the pandemic.
Figure 1 gives an illustration of how the complex and circumlocutory process of responding epidemiologically to the pandemic is influenced by a variety of factors, shown around the border of the diagram, that add complexity and set off trains of cascading consequences.

More closely specified risks have been related to changes in manufacturing, supply and distribution networks associated with Covid-19. To begin with, these were centred in particular upon the procurement of masks, gowns and other personal protective equipment and of ventilator machines. Subsequently, vaccine supply became an important source of cascading risk. It is subject to seven potential weaknesses:

- production plant located in the wrong place;
- design faults leading to operational failure at the plant;
- quality control problems leading to disruption of manufacturing processes;
- inability to satisfy demand in the allocation of batches;
- bottlenecks in the distribution process;
- cold chain problems associated with refrigeration failure;
- access problems or wrong priorities in the vaccination programme.

Each of these involves the interaction of vaccine supply with other sources of vulnerability, for example in transportation, the presence or absence of trained personnel and the supply or interruption of electrical power. In addition to these risks, there are broader ones connected with equity, sharing and so-called 'vaccine nationalism'. Finally, in either a positive or negative sense, vaccine supply is part of the developing field of 'disaster diplomacy'.

It is well known among risk experts that ordinary people find it difficult to consider multiple risks simultaneously, and especially to balance the different types of risks that they run. This complicates the political decision-making process of finding an equilibrium between people's need for epidemiological protection, the need to maintain economic activity and the need to look after people's mental health in a time of pandemic restrictions.
Economic activity will eventually recover, but it may be that the enduring legacy of the COVID-19 pandemic, besides mortality and bereavement, is an epidemic of enduringly poor mental health. Among the distributed effects of pandemics it was known years ago that there would be drastic mutations in human behaviour at all levels from the individual to the collective, but perhaps the full extent of these changes was not so easily predicted.

Good emergency planning is based on the creation of scenarios as tools for the exploration of a range of possible future impacts. The complexity of modern society means that the scenarios need to embrace the cascading concept in order to identify needs, particularly the hidden ones, that must be satisfied when disaster strikes. Whereas ‘black swans’ (totally unforeseen events) are improbable, there are many elements of modern disasters that require considerable effort and foresight for them to be identified, anticipated and prepared for. Careful evaluation of the response to COVID-19 will help provide inspiration for this work. Although, with the possible exception of a future influenza pandemic, there is little chance of a similar disaster occurring for a considerable period of time, COVID-19 has been such an all-embracing and persistent crisis that it is extraordinarily rich in unforeseen consequences and is thus fertile ground for learning. Lessons must be derived from the cascading effects as well as the primary impacts.

Figure 2 is an attempt to summarise some of the complex elements that impinge upon modern disaster management. A major challenge stems from the need to interpret the cascading consequences that they provoke.

**References**


![Knowledge is ideology](image_url)

**Underlying risk drivers**
- Complexity
- Ideology
  - extremism
  - separatism
  - isolationism
  - exclusion
- Conflict
- Climate change
- Demographic change
  - human mobility
- Culture

**Politics in the service of economics**

**DISASTER**

**SOCIAL CONDITIONS**

**PHYSICAL IMPACT**

**VULNERABILITY**

Figure 2