Coronavirus, synchronous failure and the global phase-shift

A systems analysis uncovering the light at the end of the tunnel

Nafeez Ahmed
Follow
Mar 2 · 30 min read

Source: Pixabay

Published by Insurge Intelligence, crowdfunding systems journalism for the planetary emergency. Support us to report where others fear to tread.

Five years ago, the Commission on a Global Health Risk Framework for the Future, an independent panel of distinguished scientists, issued a landmark report warning that over the next century, the world would inevitably experience at least one pandemic. The report identified a 20 percent chance that the

world would go through as many as four or more pandemics in this time-frame.

Shortly after, I advised Ubisoft on the authenticity of its pandemic-based video-game The Division. The game is set in a post-collapse New York, where a fictional virus, Variola Chimera, spreads rapidly across the city. At the time I was a visiting research fellow at the Global Sustainability Institute at Anglia Ruskin University's Faculty of Science and Technology, developing a new scientific framework to understand the dynamics of social collapse. Ubisoft asked me to assess, as an independent expert on social crisis, how realistic their scenario was.

Given the extraordinary assumptions of The Division scenario — the fictional virus was a weaponized version of smallpox created by terrorists with a faster seven-day incubation time and a 90 percent mortality rate — the ultra-rapid collapse process it envisaged across multiple critical systems was plausible. But only given those fictional assumptions.

So it's important to remember that the coronavirus is nowhere near as deadly as this fictional virus, and will have nothing like that impact.

Across the corners of the internet, you may find speculation about how the coronavirus will lead to an apocalyptic breakdown of civilization. On the opposite end, you will hear assurances that everything's pretty much going to be fine except for, perhaps, an economic downturn and disruption to our normal routines. While it's important to be aware of the range of possibilities, it's also important to recognize that we are still very far from major civilizational collapse, but not immune to more specific crises.

This is not to be sanguine about the risks. One thing that ordinary citizens, policymakers and business leaders need to remember is the fragility of our tightly-coupled social systems and supply chains. In the coming months, this systemic fragility will be increasingly visible, and will come to define the scope for societal decision-making in an even bigger way than the virus itself.

How human systems respond — but moreover, how human beings in those systems choose to respond — will make all the difference.

Because the coronavirus is definitely going to change the world. Understanding how and why will help us make better decisions about how to adapt going forward.

1. Coronavirus — what we know so far

1.1 The mortality rate could be at least ten times worse than flu

The science on coronavirus is still evolving. Data is incomplete, and due to the complexity and unknown factors involved, all scientific findings should be seen as interim. Most hard estimates of numbers of infected and killed will inevitably be incorrect (most likely they will represent the lower bound of what's happening, the true reality of which is at this stage unknowable but can be guessed at, albeit with very large inaccuracies). Many studies are being put out without peer-review to expedite rapid publication; but even those which are peer-reviewed are subject to the same uncertainties described.

With that in mind, we can still begin to build a reasonable picture.

Compared to previous major disease outbreaks like SARS and MERS (which respectively had fatality rates of 9.6 percent and 36 percent), the coronavirus has a much lower mortality rate.

The best available data suggests that the death rate appears to be less than 3 percent, but there are questions about its reliability. Clinical analysis from China has assessed 72,000 plus cases, and puts the overall figure at about 2.3 percent.

However, the risk can be broken down over an age-range. For patients over 80 years old, the mortality rate is 14.8 percent; for 70 years and over, 8 percent; for 60 years and over, 3.6 percent; for 50 years and over 1.3 percent; for 40 years and over 0.4 percent; for ages 10 to 29, a rate of just 0.2 percent; and for younger, there were no reported deaths — the latter representing less than 1 percent of patients.

For people who are already ill, the risks are also higher. The above analysis shows a 10.5 percent fatality rate for those with cardiovascular disease, 7.3 percent for diabetes, 6.3 percent for chronic respiratory disease, 6.0 percent for hypertension, 5.6 percent for cancer — and 49 percent for people already in critical condition.

There are questions about this data. Christopher Mores, a global health professor at George Washington University, has said: "We have not been able to understand what precisely has gone on there. They have changed their case definitions multiple times. It's murky what has gone into the case count and who has gone into being counted on cases."

Other independent studies looking at various parts of the data developing both in China and abroad indicate a case fatality rate of between around 2 and 1.4 percent, and possibly as low as 1 percent

— ten times worse than an ordinary flu, but still much lower than SARS or MERS. The World Health Organization summarized the range at a press conference at the end of February, noting that the mortality rate in Wuhan where the virus originated is between 2 and 4 percent, while outside of Wuhan across the rest of China it is 0.7 percent. So there is a range in the figures, which will continue to develop over time.

UPDATE: As of early March, WHO has pinpointed its estimate of the fatality rate at 3.4 percent globally.

This means that the vast majority of people who get infected will not die, may not even experience particularly severe symptoms, with some people who get the virus displaying no obvious symptoms at all.

Most people who are infected seem to recover after between 6 and 14 days, experiencing what seems like a flu. On it's face this is good news.

Yet this also creates a problem — because the symptoms are often mild and difficult to distinguish from an ordinary flu, and because people who are infected often show no symptoms at all during the early stage of infection, it can spread unnoticed fairly quickly. If it spreads to a large enough number of people, even with the relatively low mortality rate, this could still result in a high overall number of deaths particularly as it impacts people who are at higher risk due to age or illness.

1.2 The infection rate is much worse than we thought

Scientists are racing to understand how rapidly coronavirus can spread. A key metric is the basic reproduction number (R0) — the expected number of infected cases directly generated by one case of infection. The R0 can then be used to estimate the rate at which an infection can spread among a population and when it might peak and decline. If the reproduction number goes below one, it means that the epidemic can be expected to die out soon.

Generally, over time the reproduction number seems to be somewhat higher than originally hoped. One paper published in early February concluded, rather optimistically, that "the effective daily reproduction ratio has already fallen below 1, therefore while the epidemics will continue to grow, the epidemic will peak soon."

But this study was clearly limited to the draconian containment measures in China. It focused on data between the 23rd and 29th January, and based its early conclusion on the over 31,000 people infected (over 636 killed) at the time the researchers were working on it. Since then, as of 2nd March the total number of people infected more than doubled to over 89,000 (with over 3,000 killed). The low R0 figure thus specifically related to China's success in stemming the spread locally (though not necessarily permanently).

As research has progressed, the data suggests that the infection rate is higher than previously thought — possibly much higher. A study published on 24th February concludes that:

"Even under best-case assumptions, we estimate that screening will miss more than half of infected people. Breaking down the factors leading to screening successes and

failures, we find that most cases missed by screening are fundamentally undetectable, because they have not yet developed symptoms and are unaware they were exposed."

This implies that the infection rate is at least double what was previously thought.

Another study suggests it could be even higher. Epidemiologists at Imperial College London have found that two-thirds of infected people travelling globally are not being detected, which seems to be "resulting in multiple chains of as-yet undetected human-to-human transmission outside mainland China". This suggests that the infection rate maybe two to three times higher than assumed, and that a significant number of infections are going on without detection.

Studies looking at R0 numbers have produced a range of figures. Dr. Fauci's late February study estimated 2.2, "which means that, on average, each infected person spreads the infection to an additional two persons. As the authors note, until this number falls below 1.0, it is likely that the outbreak will continue to spread."

WHO at first estimated the R0 at between 1.4 and 2.5.

Increasingly these figures look too conservative. Maimuna Majumder, a computational epidemiologist at Boston Children's Hospital and Harvard Medical School estimates an r0 between 2.0 and 3.1.

A study led by Swedish researchers examining twelve other high-quality studies came to an average of 3.28, and a median of 2.79, significantly higher than WHO's estimate.

One Chinese team put the R0 at between 3.3 and 5.47. Another study led by Chinese scientists came to an estimate of 4.08, "indicating that an infected patient infects more than four susceptible people during the outbreak."

The figures are still highly preliminary and will become clearer as more data comes in.

UPDATE: One study in early March by Chinese government scientists is particularly alarming. It found that a single infected bus passenger during a 4-hour bus ride managed to infect seven other passengers, despite no interaction. This included infecting someone up to 4.5m away (over twice the safe separation distance recommended by authorities). The study also found that the virus can linger in the air for at least 30 minutes and survive on surfaces for 2–3 days.

These findings may end up changing as new data comes in but underpins the need for **proactive precaution and social distancing measures**.

1.3 Coronavirus is circulating in communities in the US, UK and Europe

Although government officials were initially slow to affirm that coronavirus is now 'here', the evidence shows fairly clearly that it's very likely that coronavirus has been quietly spreading for the last six weeks.

At the onset of the outbreak in Washington, for instance, genetic analysis of two completely separate coronavirus cases indicate that the virus had probably been spreading undetected, infecting between 150 to 1,500 people(most likely around 300–500) in Washington alone. Considering that the R0 is likely to be around 3, if we assume that 400 people have been infected but undetected, the number of infected would rise exponentially in coming weeks.

To get a sense of how many and how fast, let's do some back of the envelope calculations on what could happen within a single week. If we see each of these 400 infecting three more people over a week, with each of those newly infected then further infecting just three more that week, then the total number of infected by the end of the week would reach 3,600. If the same process continues for another week, we are already at 32,400 by week two of our thought experiment. By week three, we reach 291,600 and by week four we reach 2.6 million, and by week five 23.6m, and week six, we're at 212.6 million, 70 percent of the entire population of the United States. This is the upper end of Harvard scientist Marc Lipsitch's projection.

If we rerun this thought experiment with the most conservative assumptions, the projection rate is still significant. Let's say we have 150 people in Washington state already infected, with an R0 of 2. Over a week, they infect two more people each, who also in turn infect two further people. By the end of that week, we have 600 people infected. By week two, we're at 2,400. By week three, 9,600. By week four, we're at 38,400. By week five, 153,600. Week six: 614,400. We hit 2.5 million in week seven. Then by week eight we're at 9.3m. Week nine gets us to 39.3m, then by week ten we hit 157.3m, nearly half the entire US population.

NOTE: These are just indicative thought experiments and would need to be adjusted to reflect a more realistic scenario. For instance, the rate at which an individual infects others may be lower than suggested here. This would extentd the time it takes for the infection to spread, and also give a longer lead time to help contain or delay the spread. Alternatively, the rate might be higher. Time will provide more data.

These thought experiments do indicate that without any control measures to reduce the transmission of infection, based on the data available, it's likely that the coronavirus will spread exponentially across the US within the next two to three months. In reality, given that as of we have multiple sites of infection across the US in a dozen states such as New York, Oregon, California and so on, some with no identified lines of transmission, this suggests that the virus is already circulating in communities. Therefore, the cumulative speed of infection could be much faster than the above calculation based on Washington alone. **From this vantage, the importance of self-containment measures adopted across populations cannot be underestimated.**

We can, meanwhile, see signs already of the inability to detect transmissions — as the infection spreads rapidly, we will continue to see large jumps in the number of reported confirmations, and relatedly the number of confirmed deaths. ***Yet as this analysis makes clear, reported confirmations will always track many multiples lower than the real number of infected.***

What does this imply for other places in Europe, such as the UK?

Once again, we can extrapolate reasonably. In the US, on Friday 28th February we had 65 total cases, which jumped to 89 by the following Monday. In the UK, that weekend saw 13 new people diagnosed, taking us to a total of 40. The virus is now in all four

parts of the UK, with the number of confirmed cases jumping exponentially to 319 as of Monday 9th March 3:40pm GMT.

Although most lines of transmission could be identified, Professor Paul Cosford of Public Health England in early March pointed out that several (in fact, five) of the early new cases had occurred "among people with no links to overseas outbreaks." The concern is that "hundreds" of people may have unwittingly come into contact with some of those with the illness.

If the number of unwittingly infected is indeed at that level, then theoretically we might expect a similar exponential increase in UK cases within this same time-frame. Assuming conservatively, for instance, that only 50 people in the UK were infected at the time of publication, and no delay or containment efforts are put in place, then within ten weeks adopting an R0 of 2, we would have some 52.4 million cases of infection ten weeks from that date, some 80 percent of the entire British population. If the infection rate is lower, this process would take longer. So in reality as delay and containment measures come into play, this figure would probably be lower. Again, these figures are purely indicative.

In the first few weeks from the time of publication, the jump may not be immediately visible. However, by around week five or six, evidence of the coronavirus becoming endemic (heading toward the million mark) might emerge in the form of a heightened number of confirmed cases, though these will track well below the actual number of infections. In other words, we will only be able to fully confirm the extent of the likely spread after the fact.

The most important caveat to these thought experiments is that they assume that **no further renewed containment or delay efforts will be implemented with any success at all. This is unrealistic.** While absolute containment and delay might be

impossible at this stage, **urgent containment and delay efforts would still play a role in slowing the spread of the virus. Therefore, the thought experiments above give a sense of what could happen, but they are unlikely to reflect what will happen. The real figures are likely to be much lower if containment and delay measures are pursued on a national scale, but this process needs to be implemented fairly urgently.**

On the one hand, it would be foolish to expect that containment will be capable of simply halting the spread of the coronavirus — its rapid spread is likely to continue exponentially over the coming weeks and months at least. On the other hand, it is also clear that precautionary self-protection measures among populations if implemented diligently would help to slow this spread, playing a critical role in attempting to bring the R0 down, make the impact on the healthcare system more manageable and keep mortality rates lower.

The upshot is that bottom-up control measures that we voluntarily adopt on a mass scale will be crucial as to what happens next, and will reduce the need for top-down approaches: we all have a part to play.

2. Scenarios

According to public health experts, the coronavirus expansion could play out in four ways.

Scenario 1: The outbreak could be controlled via public-health interventions and disappear, like SARS. Containment efforts in this scenario work to bring its r0 down below 1. Currently, this looks like the most unlikely scenario given the available data on the r0, infection rate, the rapid jump in cases over several days and the implications of those cases indicating that transmission has already been happening locally over several weeks. As one Harvard scientist, epidemiologist Professor Marc Lipsitch warned, it is likely that the coronavirus will go global, reaching around 40–70 percent of the world population.

Scenario 2: A vaccine could be developed. The problem is that even though clinical trials in humans are already being prepared, a vaccine is unlikely to become available until another year or 18 months due to the sheer complexities of doing so. While we are waiting for the vaccine, the data suggests the coronavirus will likely reach a pandemic scale well within that period. A vaccine is probably coming — but it won't come in time to contain the global spread of the coronavirus.

Scenario 3: The virus could burn itself out within six months due to the impact of the summer, in terms of sunlight, temperature and humidity. This was suggested by John Nicolls, a pathology professor at the University of Hong Kong, who also added that these conditions might mean that regions like Australia and Africa would be resistant to the rapid spread of the virus.

Scenario 4: Even if it does burn itself out (and even if it doesn't), the coronavirus might never disappear. Instead it could become a permanent part of the repertoire of human viruses like the seasonal flu. As the virus spreads, and containment efforts look unlikely, it could become a common illness that reoccurs particularly in the winter.

Scenario 3 looks like our best hope. As scenario 1 now looks unlikely this leaves us with a fifth potential scenario:

Scenario 5: The coronavirus could continue to spread, but its impact might be slowed. Due to a combination of containment efforts and changing weather, a peak in the coronavirus might be achievable within the next six months.

3. Synchronous failure

The most devastating impact of the coronavirus might well be not from the virus but from the way human systems respond to it.

There can be little doubt that the coronavirus will strain social, economic and political systems to the brink. This has long been anticipated by government agencies.

3.1 Systemic fragility

In 2006, the US Department of Homeland Security issued a guide on pandemic preparedness, which warned: "The mounting risk of a worldwide influenza pandemic poses numerous potentially devastating consequences for critical infrastructure in the United States. A pandemic will likely reduce dramatically the number of available workers in all sectors, and significantly disrupt the movement of people and goods, which will threaten essential services and operations."

"State, Local and Tribal jurisdictions will be overwhelmed and unable to provide or ensure the provision of essential commodities and services," warned a Department of Defense document detailing the potential impact of a flu pandemic, declassified in 2009. A pandemic could also "cause significant

economic and security ramifications; potentially including large-scale social unrest due to fear of infection or concerns about safety." Other consequences, the documented assessed, could include "international military conflict, increased terrorist activity, internal unrest, political and or economic collapse, humanitarian crises, and dramatic social change."

A useful framework for assessing the societal impacts of the coronavirus would be the 'synchronous failure' concept led by Thomas Homer-Dixon, who has shown how the tightly-coupled nature of global systems means that "multiple stressors" can interact to create "simultaneous shifts" which can then generate "a far larger intersystemic crisis." That in turn can then "rapidly propagate across multiple system boundaries to the global scale."

The global system is currently on the brink of multiple simultaneous crises. Intersecting energy, economic and environmental crises have formed destabilizing amplifying feedback loops with social, political and cultural systems.

3.2 Global phase-shift

First and foremost, is an underlying global resource crisis which I have reported on for many years, and which was particularly well-summarized by a new report from the Geological Survey of Finland which I covered for VICE. The report concluded that the 2008 financial crash was triggered by a global shift to more expensive sources of fossil fuel energy, due to the depletion of cheaper conventional resources.

As global economic growth is fundamentally dependent on increasing energy and raw material inputs, this shift was compensated for by massive Quantitative Easing (QE) — essentially, the expansion of global debt. This debt-expansion has

fuelled GDP growth to the point that debt levels for some years have been higher than they were before the 2008 crash. But such growth is, the Finnish government study says, a “debt fueled mirage”. It warns that within the next five to ten years these dynamics would come to a head, generating a new energy-linked financial crash.

The Geological Survey of Finland study is significant because it brings a massive amount of data that fits extremely well my contention that global industrial civilization is in the last stage of its systemic life cycle, as defined by ecologist CS Holling’s four stages of a system’s growth and decline.

The **first stage** was *growth*, which took place rapidly over perhaps 200 years or so from the nineteenth century until the late twentieth century. It then went through the **second stage** of *conservation* which appeared to stabilize between 1970 and the early 2000s. The **third stage**, the *release* phase, appears to have begun around then and escalated to this day.

This is a period of uncertainty and chaos as the system begins to decline. During this stage, the uncertainty opens up new possibilities for change, where small perturbations in the system can have deep impacts in a way they could not do during the first and second phases. This is the crucial **global ‘phase shift’** point where our actions can determine the **fourth stage** of *reorganization*. In this stage, the foundations of new system can be forged, paving the way for the emergence of a new life cycle.

So there are two elements to understanding the coronavirus as a symptom of a global phase-shift. One is the collapse side — recognizing the processes of decline as symptomatic of the release phase which results in numerous structures in the system

experiencing interlocking, cascading failures. The second is the renewal side — which means watching, capitalizing on and empowering new structures, patterns and values for the new life cycle.

3.3 The risk of cascading failures

Homer-Dixon's synchronous failure framing provides a compelling way to understand the first side. His study also recognizes the centrality of the global energy system to its heightened vulnerability to synchronous failure. The potentially destabilizing impact of the coronavirus can be assessed in this context.

Homer-Dixon and his team point out the following:

"Only enormous inputs of inexpensive high-quality energy can create and sustain the unprecedented connectivity and complexity of human civilization, including the connectivity described here among this civilization's diverse component systems. As a provisional hypothesis, therefore, it seems reasonable to propose that the global energy system helps to synchronize these systems' behavior and to stimulate simultaneous crises within and across them. Other factors such as global trade and transport systems, the Internet, and simultaneous scarcity of multiple resources may also play synchronizing roles, but these factors themselves depend on, and are therefore significantly derivative of, massive flows of energy."

A **global financial correction**, in short, was long overdue — and the system was largely running on debt-fumes.

So the coronavirus has hit the global system at a point when its energy-economic vulnerability is extremely high. The most immediate impact has been on global financial markets, which have seen massive volatility in the stock market. The OECD has warned that the rate of global economic growth could be cut by half, while several major economies such as Japan and the Eurozone, could slide into recession.

But the **economic impacts** are going to go far beyond the stock market and surface measures such as GDP. Whereas the Finnish report had warned that we may see a resurgence of oil prices due to rising demand against worsening supply constraints due to the uneconomical nature of production in the US shale and Saudi sectors, it also pointed out that this might not happen. The coronavirus has almost certainly averted an oil price shock.

China's output has stalled dramatically, providing a clear-cut example of how massive containment measures have, in turn, curtailed economic activity. As the scale of the coronavirus outbreak begins to become clearer in the US, Europe and UK, containment measures will further dramatically impact economic activity as businesses close and precautionary measures are pursued by firms. We can expect domestic output to drop significantly over the next six months at least.

This means that with the economic demand pressure on the global energy system temporarily alleviated, oil prices will stay low. This, however, will continue to pose a major problem for **US shale oil and gas producers**which are experiencing haemorrhaging profits due to large rocketing extraction and operating costs, and massive debt expansion to finance their activities.

With oil prices staying low, the shale sector could find itself unable to break even or service debts. Meanwhile, with escalating US

government expenditures on domestic emergency containment measures in response to the public health crisis, there will be a question of how long the US system can finance both government and oil industry debt before it hits an irreversible crisis-point. Given that the growth in US shale is underpinning global economic growth, as the new Finnish government report observes, any oil sector crisis here will have a global impact that would propagate across the world economy.

Simultaneously, **global supply chains** are going to feel the strain as the impact of China's unprecedented containment efforts slowly unfold. US ports are bracing for cargo volumes to drop by 20 percent or more in the first quarter of 2020. Other Asian producers such as South Korea are also cutting back. Overall global manufacturing supply chains for electronics, chemicals, food, tobacco, beverages and so on will take a significant hit for several months at least. All sorts of things from cars to toys will end up facing production bottlenecks. This will take some time to saturate into industrial activity in Western societies, but it will do. Institutions like the OECD do not factor such impacts into their assessments of GDP. Therefore, its forecast of potential GDP decline is likely also conservative.

Dependence on China for ingredients in **drugs** including antibiotics also puts the production of some 150 types of drug at risk. As China's production capability slows due to the coronavirus, this could damage the medical product supply chain.

The prospect of **business closures** due to the outbreak could perhaps be the biggest wildcard, leading to unpredictable societal disruptions in public services— **food supply chains** might become strained if companies are forced to close on a large scale, or operate on reduced staffing, for a prolonged period due to the virus becoming endemic. However, much of the real risk here

comes not from supply chains, but the self-fulfilling prophecy of panic-buying, leading to empty-shelves and disruptions in availability of key food items. At worst, managing that sort of disruption could see national security agencies step in to maintain public order and keep the show on the road until things settle down.

Politically, we may see extreme nationalist groups exploiting the crisis to justify calls to close borders; and at worst this would coincide with increased hate crimes and discrimination against Chinese and Asian people. Coronavirus may also stoke anti-government resentment, particular if more extensive measures such as city-wide lockdowns are put in place if the crisis escalates particularly badly, and particularly if the crisis lasts for several months during which vulnerable people end up facing the worst impacts of an economic downturn.

Each of these factors could end up driving other unexpected behaviours and processes in the other areas. That could lead to the simultaneous escalation of crises whose complexity could overwhelm the overall capacity of systems to respond effectively. When this happens, it often leads to a process of state-militarization, where political systems tend to become 'harder' in order to contain the fall-out.

So while coronavirus is not going to lead to the collapse of civilization, it will make things worse in a context in which industrial civilization is already on the decline. It will create a huge disruption to industrial activity that will probably last the year, and generate long-lasting changes in societal organization. This could trigger a 'synchronous failure' of the kind which occurred in 2008. In a similar fashion, the multiple stressors that have already built up prior to the outbreak could interact, leading to global systems to experience another breakdown.

Meanwhile, however, as this system slides deeper into the release phase, it will also open up further opportunities for **reorganization**. To fully appreciate the other, renewal side of this phase shift we need to recall the extent to which the crisis is rooted in prevailing industrial structures.

4. Looking to renewal

4.1 The industrial origins of the coronavirus

I started this piece by mentioning the inevitability of a global pandemic for one simple reason. To highlight the point that the coronavirus is not just about China — but about the structure of our very global system.

The expansion of industrial civilization has introduced groundbreaking medical discoveries, but it has also inexorably amplified the risk of new diseases.

Human activities through industrial expansion are driving global environmental change in myriad ways. China's particular vulnerability is related to its rapid industrial growth, urban expansion, and how these factors have increasingly brought human populations into contact with animals carrying diseases. This is not a process isolated to China, though.

In 2018, a study in the journal *Acta Tropica* set out in stark terms how global industrial expansion is directly amplifying the risk of the spread of new infectious diseases spreading among humans. The focus was on vector-borne diseases passed to humans via bites from ticks, mosquitoes and other insects.

“Industrial activities have produced profound changes in the natural environment, including the mass removal of trees, fragmentation of habitats, and creation of larval mosquito breeding sites, that have allowed the vectors of disease pathogens to thrive,” wrote the authors led by Dr Robert T. Jones of London School of Hygiene and Tropical Medicine.

The study conducted an in-depth review of the scientific literature, finding that “industrial activities may be coupled with significant changes to human demographics that can potentially increase contact between pathogens, vectors and hosts, and produce a shift of parasites and susceptible populations between low and high disease endemic areas.”

To be clear, the coronavirus is not vector-borne, but zoonotic — passed from animals to humans. But the point is clear.

And while there’s no specific direct link between climate change and the coronavirus, there can be little doubt that climate change has increased the risk identified here.

One recent study points out that the combination of “climate change and climate variability, land use, water storage and irrigation, human population growth and urbanization, trade and travel, and chemical pollution” may have already have impacted on vector-borne diseases carried by ticks or mosquitos, such as “malaria, dengue fever, infections by other arboviruses, schistosomiasis, trypanosomiasis, onchocerciasis, and leishmaniasis.”

While these studies focus on vector-borne diseases, climate change will also drive-up the spread of zoonotic diseases like the coronavirus.

In January, a team of US scientists published a paper warning that climate change would intensify the spread of zoonotic diseases. There are as many as 600,000 species of mammal virus circulating in wildlife which could potentially spread to humans, but which are largely undetected. The combination of climate change and land use changes driven by industrial expansion is creating geographic range shifts in wildlife which can produce "novel species assemblages and opportunities for viral sharing between previously isolated species. In some cases, this will inevitably facilitate spillover into humans — a possible mechanistic link between global environmental change and emerging zoonotic disease."

Even if we manage to keep global average temperatures below 2°C, mammal species will end up gathering in high elevations across biodiversity hotspots which coincide with areas of with dense populations in Asia and Africa. This will lead to a higher risk of novel virus sharing in coming decades, particular from the species that has been identified as the original source of the coronavirus:

"Because of their unique dispersal capacity, bats account for the majority of novel viral sharing, and are likely to share viruses along evolutionary pathways that could facilitate future emergence in humans."

Which, in short, means that if we think the coronavirus is bad now, our unsustainable climate trajectory is setting us up for a future of both vector-borne and zoonotic pandemics that could make the coronavirus pale in comparison.

4.2 Adaptation

Even as we see evidence during the coronavirus crisis of old structures experiencing systemic failures that strain them to the brink, these processes are symptomatic of the fact that industrial civilization is moving into the final stages of its life cycle. **This stage creates wide new spaces for societal and civilizational renewal. And the seeds of that renewal are also visible even now.**

The coronavirus outbreak is, ultimately, a lesson in not just the inherent systemic fragilities in industrial civilization, but also the limits of its underlying paradigm. This is a paradigm premised on a specific theory of human nature, the neoclassical view of Homo-Economicus, human beings as dislocated units which compete with each other to maximise their material self-gratification through endless consumption and production. That paradigm and its values have brought us so far in our journey as a species, but they have long outlasted their usefulness and now threaten to undermine our societies, and even our survival as a species.

Getting through coronavirus will be an exercise not just in building societal resilience, but relearning the values of cooperation, compassion, generosity and kindness, and building systems which institutionalize these values. It is high time to recognize that such ethical values are not simply human constructs, products of socialization. They are cognitive categories which reflect patterns of behaviour in individuals and organizations that have an evolutionary, adaptive function. **In the global phase shift, systems which fail to incorporate these values into their structures will eventually die.**

At the helm of all systems are people. Systems respond to pressures and dynamics outside of their control in ways

constrained by structures, but it is not always necessary that they do so. The people who helm institutions in these systems make choices everyday, and **can make make decisions about which structures and pressures and incentives they consider important**. When people operating in systems choose to make decisions according to ethical parameters instead of simply doing what the machine tells us we must do according to past precedent, established order and the way things are, **they open the door to revolutionary shifts that can transform those systems or give birth to new systems.**

The coronavirus crisis shows us how self-defeating it really is to adopt a raw, 'fend for yourself' approach. It simply cannot work. Such an approach would lead to widespread panic, disorder and a rapid dissolution of established governance and distribution systems. Narrow survivalists who are offering this sort of 'solution' to people in response to the coronavirus, climate change or other crises, are part of the problem, in fact, part of the old self-centred, materialist-me paradigm from which this entire industrial system has been constructed. I have a message for these folks: **If all you have to offer people is to be frightened, to run and horde as many supplies as they can, and bunker down to protect themselves, you're part of the problem.** You're part of the very system that created the dynamic you're caught up in. You cannot see the bigger picture. And at a time when the imperative is to build people's capacities for sense-making, for collective intelligence, for wisdom, for love and compassion, for building and designing and engaging in the emergence of new ecological systems within a new life cycle, your advice is utterly useless.

The real way forward is obvious to anyone who pauses for a moment to reflect on what this present moment really means, in its full context, but that requires stepping beyond the immediate reactionary fears and

desires of your psyche and allowing yourself to think, see and presence as a person who is an integral node in the web of life.

That is as follows: for communities across multiple sectors to take the initiative in working together, building new cooperative processes, sharing resources, looking out for our vulnerable neighbours and friends, and ultimately providing each other support in developing public interest strategies informed by collective intelligence. As one example of a compelling strategy in the public sector, I strongly recommend economist Professor Steve Keen's call for a 'modern jubilee' to manage financial risks.

While the immediate impact of the coronavirus is, of course, systemic disruption, it is important to remember that the very process of global systemic decline of which this is a symptom, is opening up new opportunities to do things differently. Many of those opportunities are becoming visible even in the midst of what appears to be turning into a long-lasting, slow-burn crisis.

One of those is that it is now clear that rapidly dropping carbon emissions is possible. Instead of being forced to watch emissions drop by a quarter due to a crisis, robust planning can ensure that decarbonization is pursued in a determined way while protecting societal resilience. But this is just scratching the surface of possibility.

Futurist Azeem Azhar, who writes the *Exponential View* newsletter, has put together an intriguing list of how societies are already adapting rapidly to the crisis.

Firstly, he points out that the coronavirus is spurring **a new global scientific culture of open collaboration, rapid publication, and open-sourcing**. We have seen new platforms created and even new illegal scientific archives go up to aid the process of tracking and understanding the coronavirus. What happens when we leverage such processes to tackle wider issues? When we realise that the buck doesn't just stop at the coronavirus, but at climate change, global poverty, water scarcity, conflict resolution and myriad other issues that are destroying people's lives right now — and will do so further in the near future? The mutual, collaborative scientific efforts to understand and respond, to feed scientific rigour into policymaking, provides an exciting model for how human beings can work together to address numerous social problems.

Secondly, there are now **numerous remote working initiatives to attempt to keep businesses operational despite the closure of offices**. This could be end up dovetailing with gym-at-home and livestreaming cultures. As global travel cuts back, remote working and remote office solutions are being furiously explored. Going forward, we may realise how much is in fact possible without spending excessively on fossil fuel consumption for wide-scale travel — that it's possible for companies, firms and individuals to dramatically rollback their carbon footprints by being more circumspect about our travel choices.

Thirdly, Azhar points out that as global supply chains feel the pain from the silence of Chinese factories, **the demand for local solutions will ramp up**. There could be two results from this, in my view. One is that we may learn that we really don't need to keep buying 'shit we don't need'. Another is that for the stuff we do need, we may innovate simpler local-based solutions. Local manufacturing will be increasingly important, and powerful technologies like 3D printing may come of age.

Relatedly, Azhar highlights the need for **more local food and energy production**. Could the impact of this crisis, as it strains supply chains, also end up feeding into greater public demand for more investment in resilience at the local level for access to food and energy? It's worth noting that even the renewable energy transition is currently heavily dependent on critical raw materials and rare earths imported from China — but there has been lots of research into how those can be substituted with other materials, or more powerfully, recycled. Those process are currently in their infancy in Europe — currently recycling rates for critical raw materials are at below 1 percent, meaning that the potential is exponential. A prolonged crisis may spur innovation in this area. Azhar specifically points out the potential of hydroponic vertical farming in urban areas, which are often pesticide and herbicide free, and use less water. There are questions and limitations about such enterprises, but we could see greater the impetus for more local forms of sustainable farming at community and city levels.

Light at the end of the tunnel

So it seems likely that the world is about to enter a dark tunnel for at least the next six months to a year. But there's light at the end of that tunnel, depending on our choices.

On its face, an economic crisis would of course appear to undermine the material capacity to support the shift to these new systems and processes.

Yet there's one thing that systems modelling doesn't account for: and that's the human capacity to give freely regardless of material constraints. As the coronavirus crisis kicks off, it is our capacity through love to work, give and share not for monetary gain, not for self-protection, not for any reason other than the intrinsic beauty of the act itself, that will get us through to the other side.

And as this global phase shift accelerates, as this civilization built over the last few hundred years slides deeper into chaos and uncertainty, it is that capacity which will provide us the strength and resilience to weave the foundations of a new emerging system that is adaptive to, not dysfunctional with, the web of life.

Dr Nafeez Ahmed is Executive Director of the System Shift Lab. He is an award-winning investigative journalist, change strategist and systems theorist. Nafeez is editor of the crowdfunded investigative journalism platform, INSURGE intelligence, and 'system shift' columnist at VICE where he reports on 'global system transformation'. Previously a Guardian environment blogger where he covered the geopolitics of interconnected environment, energy and economic crises, he is a former Visiting Research Fellow at Anglia Ruskin University's Global Sustainability Institute, which supported his research to produce his latest book, Failing States, Collapsing Systems: BioPhysical Triggers of Political Violence (Springer, 2017). He is a Research Fellow at the Schumacher Institute for Sustainable Systems and a Fellow at the Royal Society of Arts. He is the winner of the 2010 Routledge-GCPS Essay Prize and 2015 Project Censored Award for Outstanding Investigative Journalism, and has been twice listed among the Evening Standard's top 1,000 most influential Londoners.